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Railway Mechanical Engineer

September 1942

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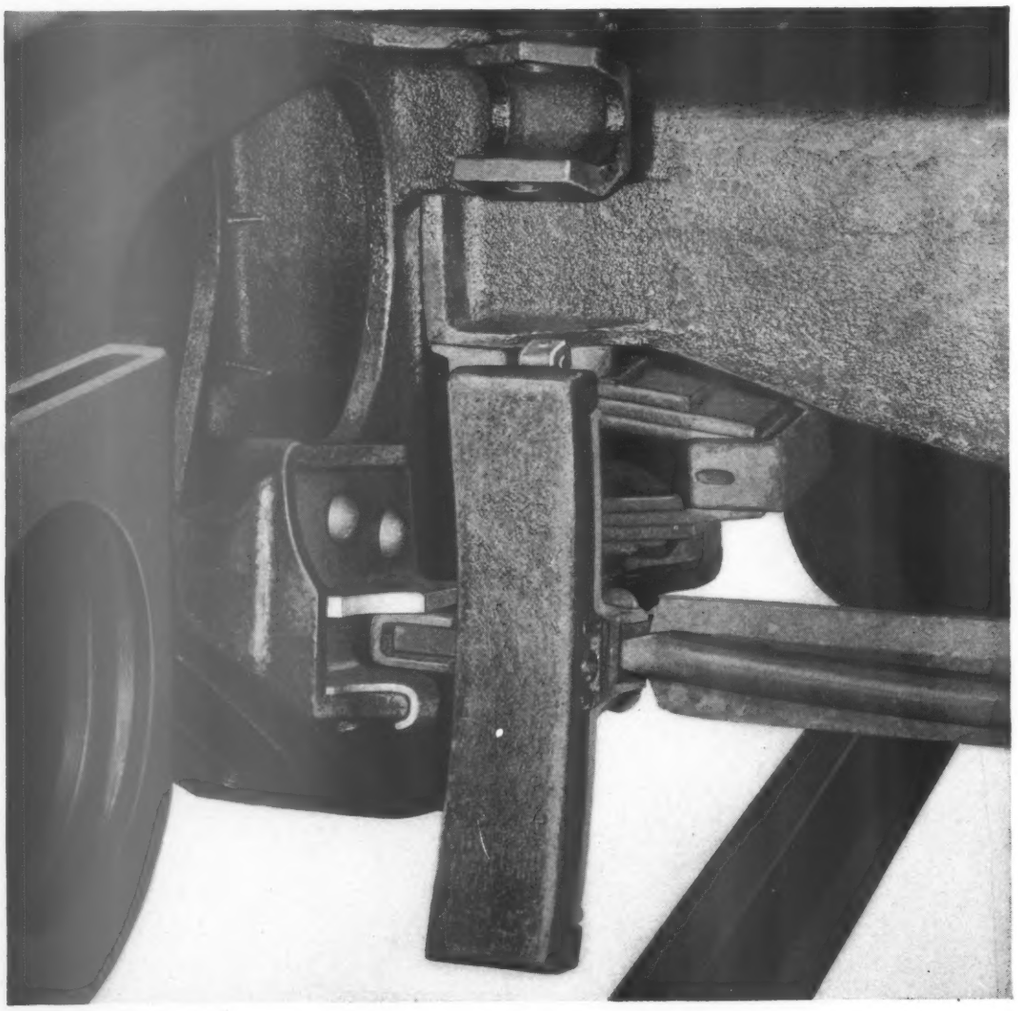

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SEPTEMBER, 1942

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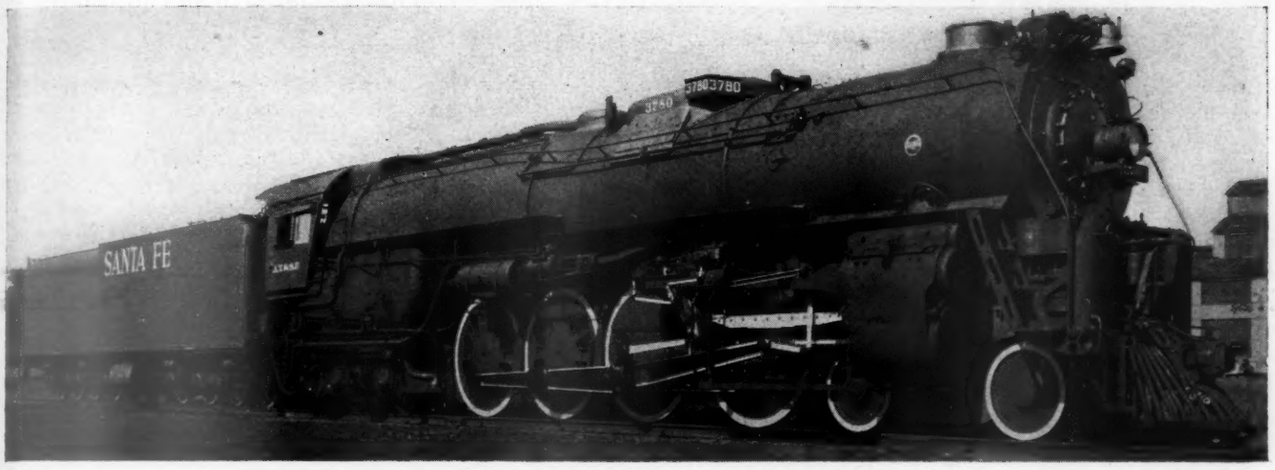


Progressive Changes in

Santa Fe 4-8-4 Locomotives

The locomotives of the last order, delivered late in 1941, are equipped partly with plain-bearing Tandem main rods and partly with Timken roller-bearing rods

DURING the latter half of 1941 the Atchison, Topeka & Santa Fe received ten locomotives of the 4-8-4 type from the Baldwin Locomotive Works. These locomotives are similar in the basic features of the design to the eleven locomotives of the same type which were purchased from this builder in 1938.* The earlier order of locomotives all had boilers with nickel-steel shell plates. The inside firebox sheets of ten locomotives were of carbon steel, while on the eleventh unit they were of nickel steel. In the 1941 order the inside fireboxes of all of the locomotives are nickel steel. The boiler steel was furnished by Lukens.

Two Types of Driving Rods

The features of greatest interest in these locomotives are the driving rods. Eight are equipped with plain-bearing rods with tanden main rods; two are fitted with Timken roller-bearing side and main rods. Lightweight rolled-steel pistons and piston rods and crossheads of the multi-bearing type aluminum alloy gibs are installed on all ten locomotives.

On the eight locomotives with the plain-bearing rods the Tandem main-rod drives on the crank pins of the second and third pairs of driving wheels. Side rods connect the main and front drivers and the intermediate and rear drivers, respectively. The main-rod fit on the crank pin is 8¾ in. in diameter. The two sections of the Tandem main rod are assembled on a steel sleeve the inside diameter of which is $10^{25}/_{32}$ in. This sleeve is pressed into the two forks of the driving section of the main rod and the bronze-bushed parallel section has 1/64 in. clearance on the sleeve.

The two side rods are mounted inside the main rod. Both ends of the rear side rod are fitted with steel bushings with bronze floating bushings between the steel bushings and the crank-pin fits. The front side-rod bearings are similar except that the bearing surfaces between the bronze floating bushing and the steel rod bushing are spherical to accommodate the controlled lateral movement of the front driving wheels.

The rods are of deep I-section with relatively narrow top and bottom flanges. The grease cavities are drilled completely through the heavy section immediately back of the bearings and are countersunk. The cavities are closed by countersunk washers held in place by a through bolt. Grease fittings are applied to the bolt head with a

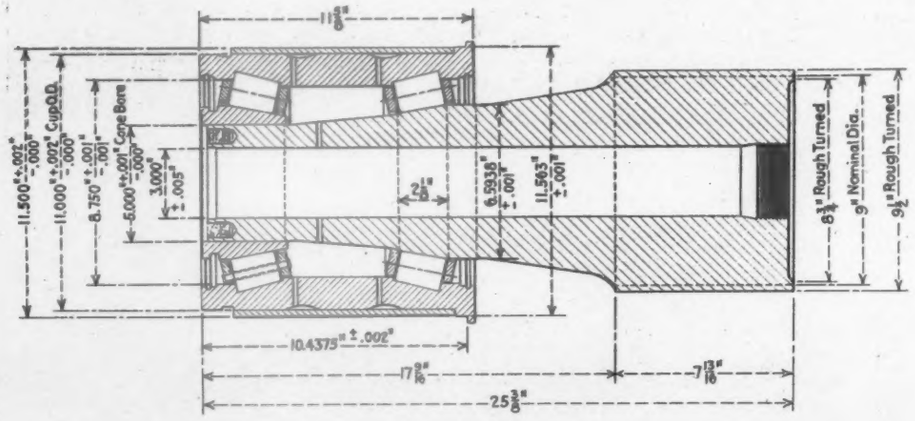
* For a brief description of these locomotives see the *Railway Mechanical Engineer* for February, 1939, page 49.

drilled passage leading into the cavity. Holes are drilled from the cavity to the inside of the rod bore leading into a circumferential groove which distributes the lubricant around the bearing.

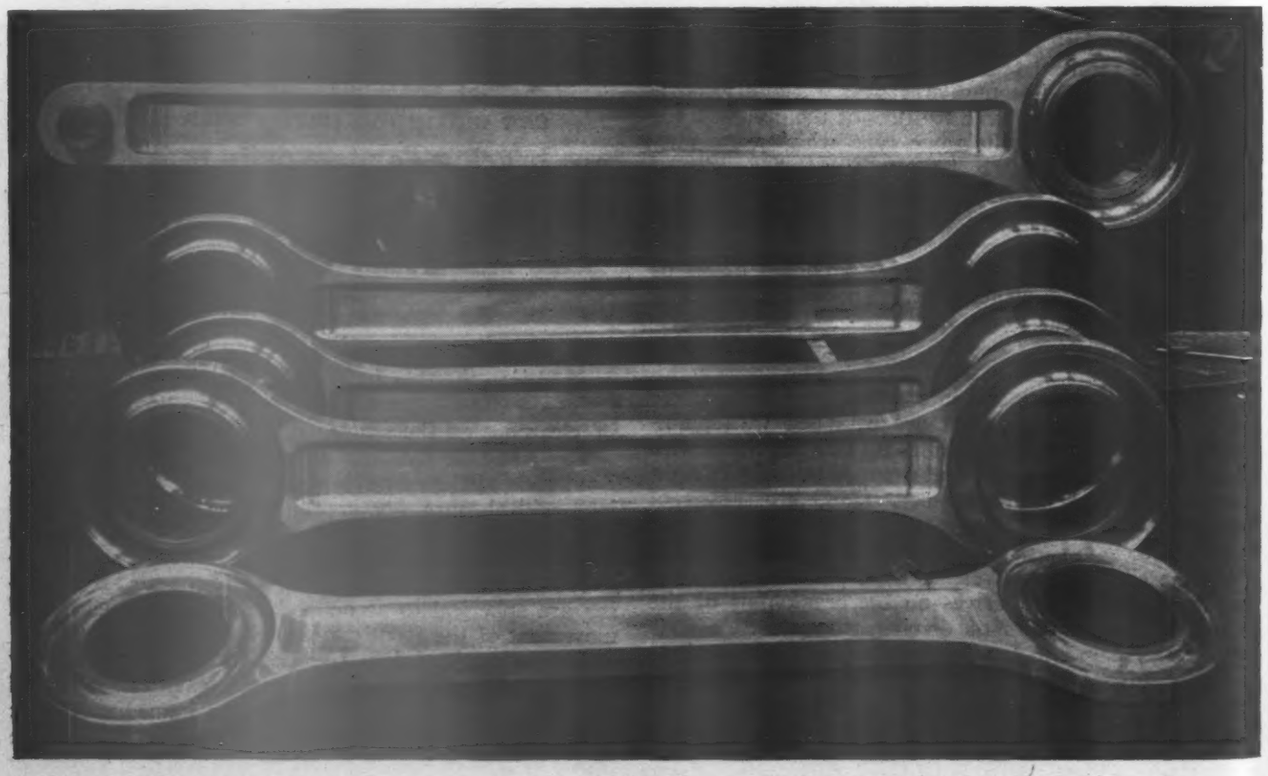
The rods, which are of nickel-chrome-molybdenum steel, quenched and tempered, are of deep, narrow section. The main rod has a depth of 8 in. near the crosshead connection and tapers to 12 in. near the main crankpin connection. The web is ½ in. thick. The flanges, which are 3½ in. wide by $1\frac{11}{16}$ in. deep at the crosshead end, are 5 in. wide by $1\frac{5}{16}$ in. deep near the main crank pin. The parallel main rod has a uniform width over the flanges of 3¾ in., tapering down from a depth of 15 in. near the main crank pin to 12 in. near the intermediate crank pin. The web is $\frac{7}{16}$ in. thick. The rear side rod tapers from a depth of 8 in. at the outer end to 11 in. at the inner end. The front side rod is a parallel section 12 in. deep by 2¼ in. wide over the flange. The webs of both side rods are $\frac{7}{16}$ in. thick.

The driving wheels are of the Baldwin disc type. The main and intermediate driving wheels are cross-balanced in accordance with the procedure described in the tentative report of the A. A. R. Mechanical Division special sub-committee on counterbalance dated August, 1939. The front and back driving wheels are not cross-balanced. The overbalance on each driving wheel is 150 lb. The maximum dynamic augment on the intermediate driving wheel, at diametral speed, is 7,680 lb.

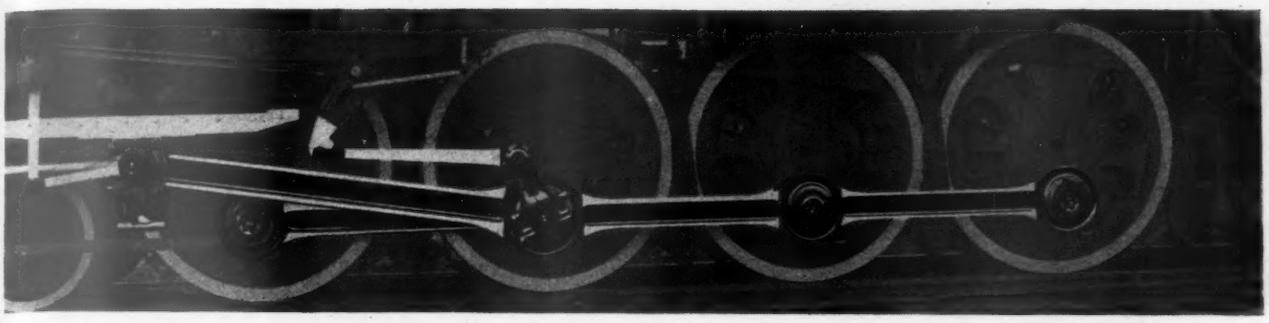
Each of the last two locomotives of the order has a complete installation of Timken roller-bearing driving rods. The rod set consists of a main rod, a front side rod, two intermediate side rods between the main and intermediate crank pins, and a rear side rod. One of the drawings shows the arrangement of the main crank-pin assembly. This consists of a triple roller bearing about which turns a sleeve 13 in. in diameter by 16 in. in length. On this sleeve are assembled, first, the rear end of the front side rod; second, the front end of the inside intermediate; third, the rear end of the main, and, fourth, the front end of the outside intermediate rod.



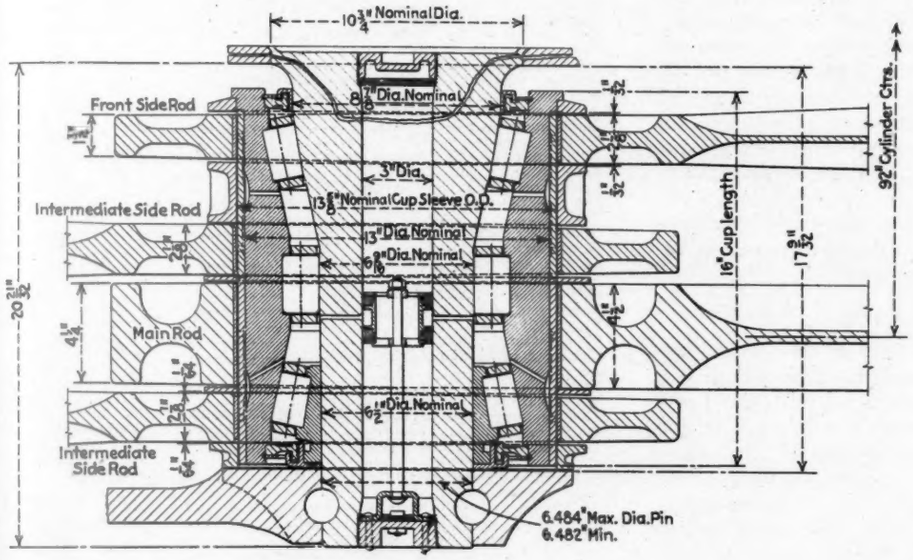
Section through the intermediate crank-pin roller-bearing assembly



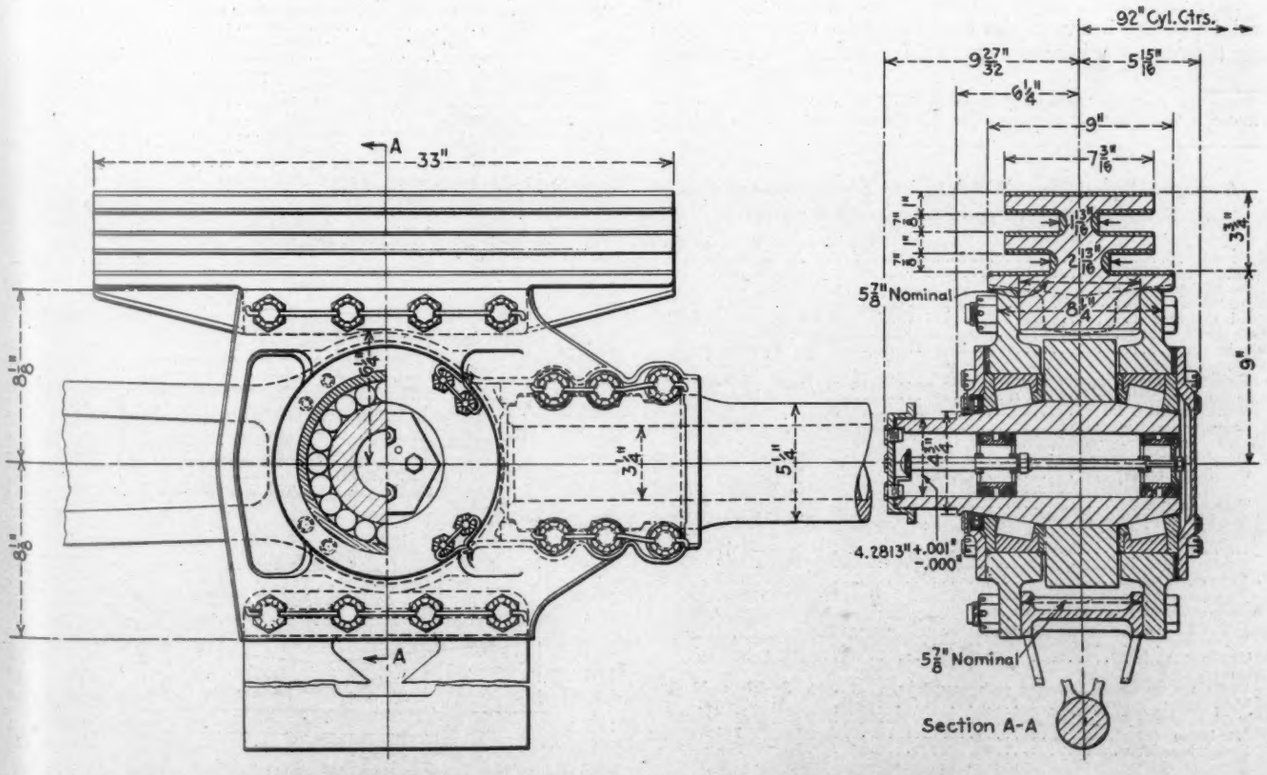
The Timken rods for one side of the 4-8-4 type locomotive



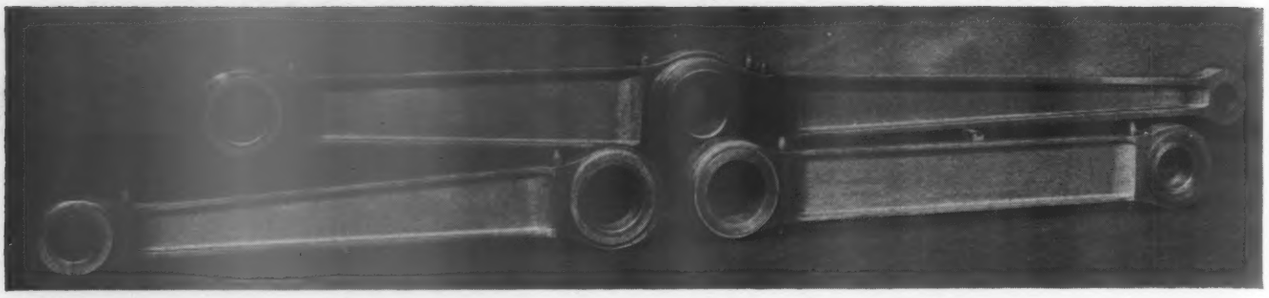
On two of the locomotives there are complete installations of Timken roller-bearing rods



Section through the roller-bearing and rod assembly on the main crank pin



The Timken roller-bearing crosshead is counter-weighted to balance the inertia moments



The Tandem main rod and two side rods for one of the Santa Fe 4-8-4 type locomotives

On the roller-bearing sleeve of the intermediate crank pin are assembled, first, the rear end of the inside intermediate side rod; second, the front end of the rear side rod, and, third, the rear end of the outside intermediate side rod. Thus, the rear side rod is directly in line with the main rod and, except for the front side rod at the inside of the main crank-pin sleeve, the forces applied to the bearing sleeves through the rods are symmetrically distributed.

The methods of lubrication are essentially the same as those described in connection with a previous application of the Timken roller-bearing rods.*

Reciprocating Parts

The reciprocating parts on all ten of the locomotives are of the Timken lightweight design. The piston is of rolled-steel, light Z-section, and is fitted with the Locomotive Finished Material Company's combination universal sectional wearing and packing rings. The piston rod is hollow with 1-in. walls. The crosshead is of the Timken two-piece type, clamped on the tapered multi-shoulder bearings of the piston rod. The multi-bearing crosshead shoe is aluminum with bearing metal faces on the ledges.

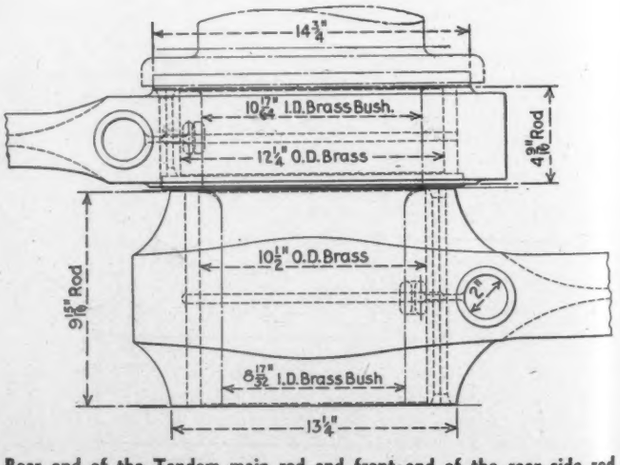
One of the features of the crosshead is a counterweight bolted between the two halves of the body opposite the crosshead shoe. This balances the tilting moment

* See the *Railway Mechanical Engineer* for December, 1935, page 493—"Roller Bearing Rods in Passenger Service Over a Year."

General Dimensions, Weights and Proportions of the A. T. & S. F. 4-8-4 Type Passenger Locomotives

	8 Locos.	2 Locos.*
Railroad	A. T. & S. F.	
Builder	Baldwin	
Type of locomotive	4-8-4	
Road class	3765	
Road numbers	3776-3783	3784-3785
Date built	Aug., 1941	
Service	Passenger	
Dimensions:		
Height to top of stack, ft.-in.	16-0	
Height to center of boiler, ft.-in.	10-10½	
Width overall, in.	11-0	
Cylinder centers, in.	92	
Weights in working order, lb.:		
On drivers	281,900	286,140
On front truck	93,320	92,050
On trailing truck	119,410	118,520
Total engine	494,630	496,710
Tender, two-thirds oil and water	375,155	375,155
Wheel bases, ft.-in.:		
Driving	21-3	
Rigid	13-10	
Engine, total	50-0	
Engine and tender, total	108-2	
Wheels, diameter outside tires, in.:		
Driving	80	
Front truck	42	
Trailing truck	50	
Engine:		
Cylinders, number, diameter and stroke, in.	2—28 x 32	
Valve gear, type	Walschaert	
Valves, piston type, size, in.	15	
Maximum travel, in.	7⅝	
Steam lap, in.	2¼	
Exhaust lap, in.	1/4	
Lead, in.	3/16	
Cutoff in full gear, per cent	60	
Boiler:		
Type	Conical	
Steam pressure, lb. per sq. in.	300	
Diameter, first ring, inside, in.	88¼	
Diameter, largest, outside, in.	102	
Firebox, length, in.	143 21/32	
Firebox, width, in.	108	
Height mud ring to crown sheet, back, in.	78 5/16	
Height mud ring to crown sheet, front, in.	93 3/32	
Combustion chamber length, in.	64	
Thermic syphons, number	One	
Tubes, number and diameter, in.	52-2¼	
Flues, number and diameter, in.	220-3½	
Length over tube sheets, ft.-in.	21-0	
Net gas area through tubes and flues, sq .ft.	10.5	
Fuel	Oil	
Grate area, sq. ft.	108	
Heating surfaces, sq. ft.:		
Firebox and comb. chamber	430	
Thermic syphons	29	
Firebox, total	459	
Tubes and flues	4,852	
Evaporative, total	5,311	
Superheater	2,366	
Combined evap. and superheater	7,677	
Tender:		
Type	Water bottom	
Water capacity, gal.	25,000	
Fuel capacity, gal.	7,000	
Trucks	Eight-wheel	
Journals, diameter and length, in.	6½-in. roller bearings	
Rated tractive force, engine, 70 per cent, lb.	66,000	
Weight proportions:		
Weight on drivers ÷ weight engine, per cent	57.0	57.6
Weight on drivers ÷ tractive force	4.3	4.3
Weight of engine ÷ evaporation	93.1	93.6
Weight of engine ÷ comb. heat. surface	64.4	64.7
Boiler proportions:		
Firebox heating surface, per cent combined heating surface	6.0	
Tube-flue heating surface, per cent combined heating surface	63.2	
Superheater heating surface, per cent combined heating surface	30.8	
Firebox heating surface ÷ grate area	4.3	
Tube-flue heating surface ÷ grate area	44.9	
Superheater heating surface ÷ grate area	21.9	
Combined heating surface ÷ grate area	71.1	
Evaporative heating surface ÷ grate area	49.2	
Tractive force ÷ grate area	611.1	
Tractive force ÷ evaporative heating surface	12.4	
Tractive force ÷ combined heating surface	8.6	
Tractive force × diameter drivers ÷ combined heating surface	687.7	

* With roller-bearing crossheads and rods.



Rear end of the Tandem main rod and front end of the rear side rod on the intermediate crank pin

caused by the inertia of the overhanging crosshead shoe at the top, thus maintaining uniformly distributed wear on the guide bearing surfaces.

The piston, piston rod, and crosshead body are Timken high-dynamic steel, quenched and drawn to develop a yield point of 110,000 lb.

Progressive Changes in Succeeding Orders

Several orders of 4-8-4 type locomotives in basic design similar to those delivered last year have been built for this road since early in 1927. There have been some changes in the boiler dimensions and proportions. In the early orders the boiler diameter was 88 in. and the working pressure 210 lb., with cylinders 30 in. in diameter by 30 in. stroke. The tractive force was 66,000 lb. The design of the boiler was changed in the 1938 order, increasing the diameter to 90 in. and providing for a working pressure of 300 lb. per sq. in. The distribution of the heating surface has been changed slightly in the various orders, but there has been no major change in this respect. With the increase in boiler pressure the cylinders were changed to 28 in. diameter by 32 in. stroke. The tractive force has remained unchanged throughout these changes.

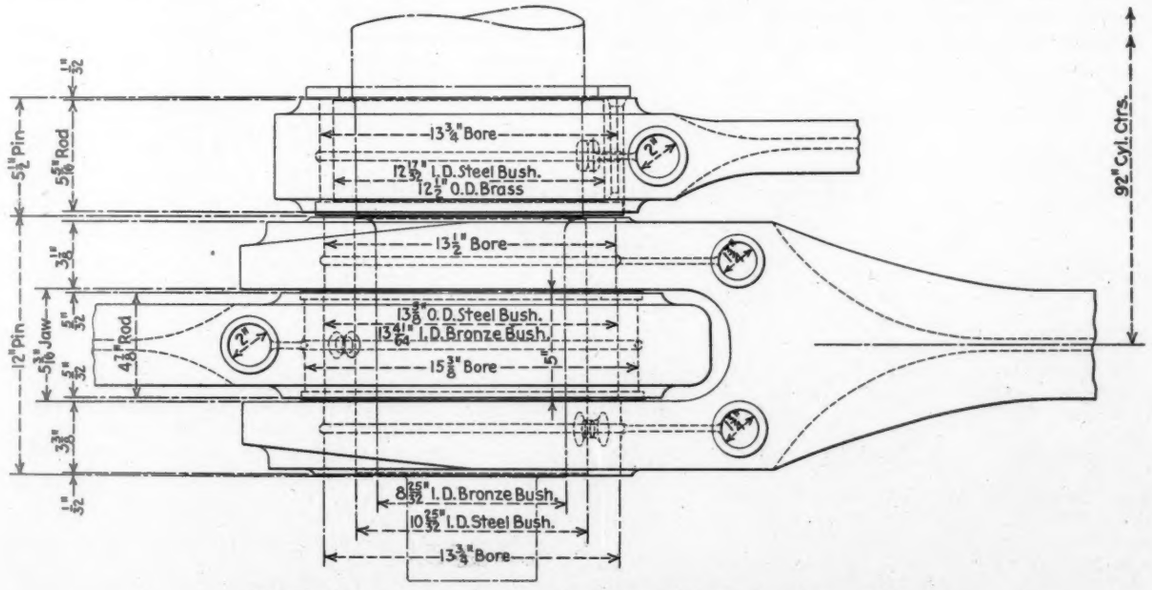
The earlier orders of these locomotives had 73-in. driving wheels, with weights on drivers varying around 270,000 lb. and total engine weights which increased progressively from 422,000 lb. to 433,500 lb. The new locomotives, as well as those built in 1938, have 80-in. driving wheels. In the 1938 order the weight on drivers is 287,000 lb. and the total engine weight just under 500,000 lb. The weight on the driving wheels of the eight locomotives with plain-bearing rods is about 282,000 lb. and the total weight of the engines 494,630 lb. The locomotives with the roller-bearing rods weigh 286,000 lb. on the drivers and 496,710 lb. for the total engine.

Other progressive changes which have been made in the design of these locomotives are in the engine- and trailing-truck wheel diameters. Starting with engine trucks with 33-in. wheels and trailer trucks with 40-in. wheels, the diameters of the engine-truck wheels were stepped up to 37 in. on the 1938 lot and to 42 in. on the 1941 locomotives. On the latter the trailing-truck wheels were also increased from 40 in. in diameter to 50 in. in diameter.

Tender sizes on the Santa Fe 4-8-4 type have also progressed upward. The locomotives of this type ordered up to and including 1929 had a water capacity of 15,000 gals. and a fuel capacity of 20 tons. These tenders were carried on two six-wheel trucks. In the 1938 order the water capacity was increased to 21,000 gals. and the fuel capacity was 7,000 gals. of oil. This tender was also carried on two six-wheel trucks. The water capacity of the tenders for the 1941 locomotives has been further increased to 25,000 gals. The fuel capacity remains at 7,000 gals. These tenders are carried on two eight-wheel trucks.

Other Features of the Latest Design

The locomotives are built up on General Steel Castings one-piece cast-steel locomotive beds, of which the cylinders are an integral part. They have the Batz spring arrangement on the engine trucks. The trailing trucks are the Commonwealth four-wheel Delta type. All journals on the locomotive and tender are fitted with Timken roller bearings; those on the engine-truck and driving axles are inside, with the journal boxes connected in pairs. The driving boxes are the split type and are fitted with Franklin compensators and snubbers. There is no lateral between the driving boxes and driving-wheel hubs.



The Tandem main-rod and front side-rod assembly on the main crank pin

There is a total lateral play in the front wheel pedestals of 1⅛ in. and in the main, intermediate and back of ⅜ in.

Alloy steel is extensively used in the running gear of these locomotives. Like the rods of the eight locomotives with plain-bearing rods, the driving axles as well as the axles of the engine and trailing trucks are of quenched and tempered chrome-molybdenum steel. The same material is also used for the main and intermediate crank pins. The front and back crank pins are quenched and tempered carbon steel.

These locomotives are equipped with Worthington feedwater heaters, Type E superheaters with multiple throttles in the headers, Signal Foam Meters, and with one Thermic syphon in each firebox. They are the first order of this type on the Santa Fe which has been fitted with two 8½-in. cross-compound air compressors. The brakes are the Westinghouse No. 8ET.

The general weights, dimensions, and proportions are shown in the table.

Conventions in Print

Member meetings of coordinated associations are cancelled because of wartime conditions—Committee reports will be presented in November issue

MEMBER meetings of the four Coordinated Mechanical Associations—the Railway Fuel and Traveling Engineers' Association, the Car Department Officers' Association, the Master Boiler Makers' Association, and the Locomotive Maintenance Officers' Association—will not be held this year because of the pressure of wartime demands on the supervisors of the various railroads who ordinarily participate and find the convention meetings a source of much help and interest. However, the four associations are proceeding with their plans to have prepared for later presentation to their members the committee reports formerly part of the programs of each convention and published as part of the proceedings. It is hoped in this way to make available to all members information of value concerning developments in their respective fields.

It has been customary in the past for the *Railway Mechanical Engineer* to devote the issue following the association meetings to the publication of the various reports presented during the convention sessions. The same practice will be followed this year and the November issue will be a "convention issue." The committee reports which are available in time for publication will be used as though convention sessions had actually been held and the work of the various committees presented directly to the members.

The reports scheduled for preparation by each association are listed below.

Railway Fuel and Traveling Engineers' Association

Air Brakes—Chairman, F. T. McClure, general air brake supervisor, Atchison, Topeka & Santa Fe, Topeka, Kans.
- (a) Handling Air Brakes on Diesel Locomotives in Freight Service.
- (b) Can Air Brake Tests at Intermediate Terminals Be Eliminated?

Locomotive Firing Practice—Coal—Chairman, W. O. Shove, general road foreman of engines, New York, New Haven & Hartford, West Haven, Conn.

Locomotive Firing Practice—Oil—Chairman, Roy W. Hunt, fuel supervisor, Atchison, Topeka & Santa Fe, Los Angeles, Calif.

Gas Turbine Powered Locomotives—Chairman, L. P. Michael, chief mechanical engineer, Chicago & North Western, Chicago.

Fuel Records and Statistics—Chairman, E. E. Ramey, fuel engineer, Baltimore & Ohio, Baltimore, Md.

Front Ends, Grates, Arches and Ash Pans—Chairman, J. R. Jackson, engineer of tests, Missouri Pacific, St. Louis, Mo.

The Road Foreman and the Diesel Locomotive—Chairman, W. D. Quarles, general mechanical instructor, Atlantic Coast Line, Rocky Mount, N. C.

Coal—Various Sizes in Relation to Fuel Economy—Chairman, S. A. Dickson, supervisor fuel economy, Alton, Bloomington, Ill.

Utilization of Motive Power—Chairman, A. A. Raymond, superintendent fuel and locomotive performance, New York Central, Buffalo, N. Y.

Car Department Officers' Association

Selection and Training of Supervision—Chairman, J. E. Keegan, chief car inspector, Pennsylvania, Chicago.

Repair Methods and Shop Kinks—Chairman, R. K. Betts, foreman car repairs, Pennsylvania, Chicago.

Roller Bearing Inspection and Maintenance. Draft and Buffer Gear Maintenance—Chairman, C. P. Nelson, general passenger car foreman, Chicago & North Western, Chicago; Vice-Chairman, K. H. Carpenter, superintendent car department, Delaware, Lackawanna & Western, Scranton, Pa.

Packing and Servicing Journal Boxes—Chairman, J. R. Brooks, supervisor lubrication and supplies, C. & O., Richmond, Va.

Minimum Detention of Bad Order Cars—Chairman, H. E. Wagner, division general car foreman, Missouri Pacific, Dupo, Ill.

Interchange and Billing for Car Repairs—Chairman, E. G. Bishop, general foreman car department, Illinois Central, E. St. Louis, Ill.

A. A. R. Loading Rules—Chairman, E. N. Myers, chief interchange inspector, Twin City Joint Car Inspection Association, St. Paul, Minn.

Passenger Car Terminal Painting; Freight Car Painting—Chairman, Harry Stahnke, general painter foreman, New York Central, Albany, N. Y.

Master Boiler Makers' Association

Topic No. 1—General Prevention of Cinder Cutting of Locomotive Boilers.

Topic No. 2—Application and Maintenance of Flues and Arch Tubes, Without Copper Ferrules.

(a) How Does Mileage and Service Compare to Those Applied with Copper Ferrules?

(b) Should Flues and Tubes Be Welded to the Firebox Sheet at Time of Application?

Topic No. 3—Treating Boiler Feedwater Chemically.

(a) What Is the Best Approved Method of Blowing Down Boilers? (1)—At terminals. (2)—By the engine crews on the road?

Topic No. 4—What Defects Have Developed in High-pressure Boilers and What Methods Are Used to Repair Them?

Topic No. 5—Recommendations Concerning the Latest Methods That Are Being Used in the Fabrication of Boilers of Iron, Steel and Alloy Materials.

Topic No. 6—Substitution in Material and Practices in Boiler and Tender Fabrication and Maintenance for the Conservation of Both Material and Labor.

Locomotive Maintenance Officers' Association

Committee of Air Brake Equipment Maintenance—Wartime Maintenance of Air Brake Equipment—Chairman, J. P. Stewart, general superintendent air brakes, Missouri Pacific, St. Louis, Mo.

Committee on Improved Locomotive Maintenance Practices—Facilities and Practices Used in Diesel Locomotive Repairs.

Committee on Lubrication—Chairman, J. R. Brooks, supervisor lubrication and supplies, Chesapeake & Ohio, Richmond, Va.

Committee on Personnel—Selection, Procurement and Training of Supervisory Personnel—Chairman, F. K. Mitchell, assistant general superintendent of motive power and rolling stock, New York Central, New York.

Committee on Safety.

Committee on Shop Tools—Wartime Substitutions for Critical Tool Steel in Railroad Machining Work—Chairman, E. A. Greame, tool room foreman, Delaware, Lackawanna & Western, Scranton, Pa.

Committee on Welding—Report to A. A. R. by H. E. Gannett, general welding supervisor, Chicago, Burlington & Quincy, Chicago, Ill.

* * *

Caboose built by the American Car and Foundry Company for the Clinchfield

Changes in Journal Bearings to

Conserve Strategic Metals

Progress report of A. A. R. research program develops the advantages of machine broached linings and of bearings with depressed backs—Ferrous-back bearings still under study

EARLY in January of this year, the Association of American Railroads, Mechanical Division, began a comprehensive study of the possibility of reducing strategic metals used in car journal bearings. This research is being conducted in the laboratory of the Railway Service & Supply Corp., Indianapolis, Ind., and has three primary objectives, namely, to secure increased service from present bearings, to minimize the amount of strategic metals required in journal bearings, and to investigate the possibility of replacing copper-bearing alloys by some form of ferrous back.

The journal-bearing test machine showing method of applying the load by spur gear and shaft connection from a large handwheel in the rear

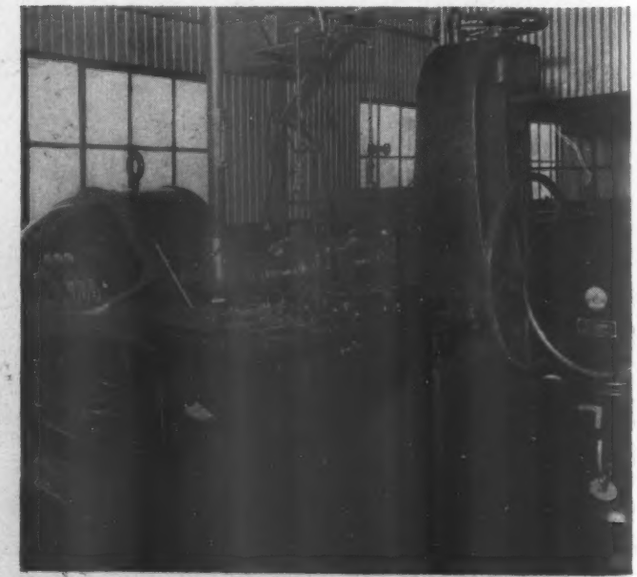
To date, three primary bulletins or progress reports have been issued, the first of which relates to an important detail of wedge construction. The second recommends broached linings for all bearings and suggests an A. A. R. modified, "depressed back" design for all orders of new journal bearings. The third bulletin shows the advantages of reduced lining thickness and recommends further slight changes in the modified journal-bearing design which will facilitate manufacture and save a still larger percentage of the strategic metals used in these bearings. The performance of various types of ferrous-back bearings is still being studied.

Personnel of the Research Committee

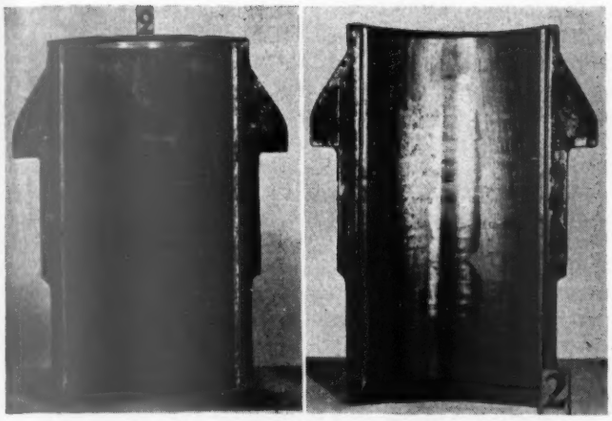
The Committee on Journal Bearing Development, appointed to represent the A. A. R., Mechanical Division, in this special research, includes Chairman W. I. Cantley, mechanical engineer, A. A. R. Mechanical Division; J. R. Jackson, engineer of tests, Missouri Pacific; L. B. Jones, engineer of tests, Pennsylvania; C. B. Bryant, engineer of tests, Southern; J. W. Hergenhan, assistant engineer, test department, New York Central; and J. Mattise, general air brake instructor, C. & N. W.

Tests are conducted under the direction of the A. A. R. research committee in the laboratory of the Railway Service & Supply Corp. E. S. Pearce, president of this company and owner of a patent on the modified light-weight journal bearing design, has arranged to grant railroads, carbuilders and bearing manufacturers non-exclusive licenses to make and use the modified journal bearing on railway equipment during the present national emergency, in consideration of nominal payments of one dollar a year. Another requirement is the furnishing of monthly reports to show the number of bearings manufactured or used and sold under this license, also indicating in so far as practicable whether the applications are to freight cars, passenger cars, maintenance of way cars, or locomotive tenders.

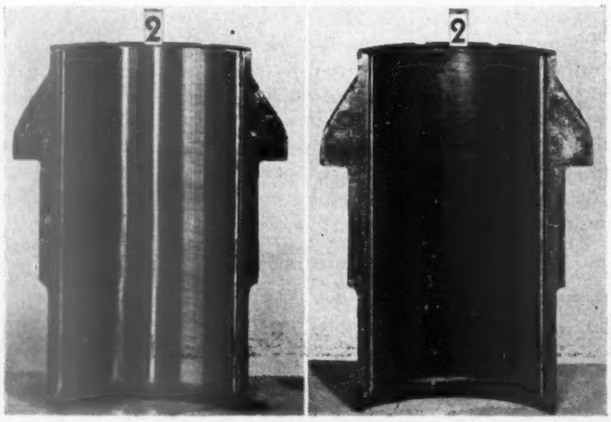
In the first bulletin, issued on January 19, the research committee called attention to undesirable journal-bearing and wedge conditions, as shown in one of the



The motor drive of the test machine



A. A. R. modified journal bearing with as-cast lining—Left: Fair surface and partial crown contact before test—Right: Irregular contact area of 10.30 sq. in. after test



Same A. A. R. modified bearing with machine-broached lining—Left: Accurate full-line crown contact before test—Right: Two-point loading and 8.73 sq. in. of bearing area test

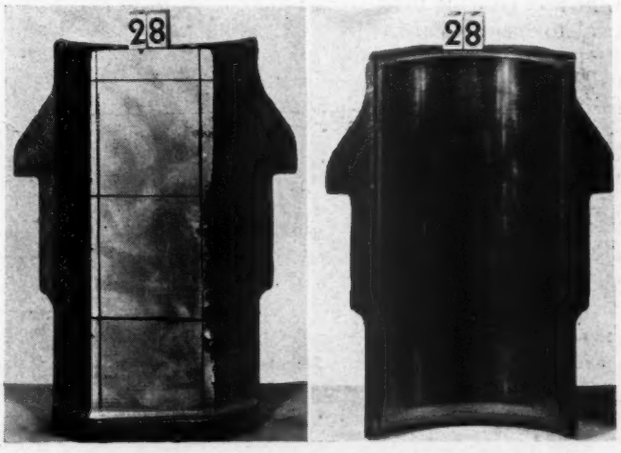
illustrations, which tend to cause collar breakage and attendant waste of journal bearing metal. With a wedge of standard length and having straight, square ends, an accurate fit is secured on the journal-bearing collar with attendant development of shear stress only which the collar is designed to resist safely. With a taper-end wedge, or one having a ridge which brings the contact point at the top of the journal-bearing collar, the collar is subject to bending stress which is excessive in amount and tends to crack or break off the collar. The Mechanical Division, general committee, approved the recommendation of the research committee that corrective measures be taken to assure a proper fit at this important bearing surface between the wedge end and the journal-bearing collar on all equipment now in service.

Advantages of Broached and Depressed-Back Bearings

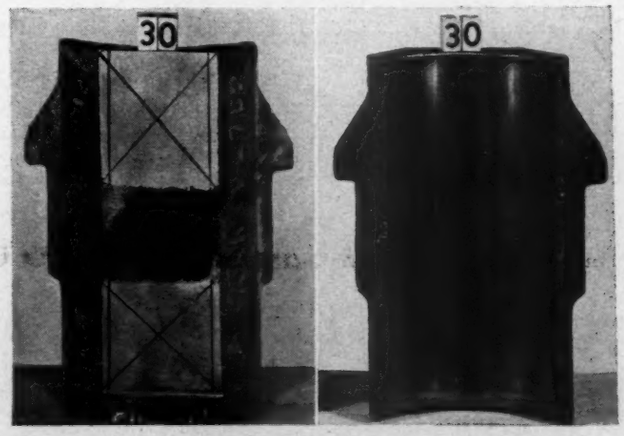
In determining the economic and operating value of properly machine-broached journal bearings, as compared with as-cast linings, and to determine the merit of A. A. R. modified depressed-back bearings, as compared with former standard A. A. R. plain-back bearings, Series A tests were conducted, embracing 60 runs. Journal bearings used during the tests were supplied by the National Bearing Metals Corporation, St. Louis, Mo., the Magnus Metal Corporation, Chicago, and by the Pennsylvania. All of these bearings were babbitt lined except six, supplied by Magnus, which were lined with Satco metal. The operating test schedule called for a continuous run for 170 min. under 16,375 lb. total load, including 30 min. at 30 m. p. h., 20 min. at 20 m. p. h. and 120 min. at 50 m. p. h. In all test runs of this series, 8 lb. of packing and 3.25 lb. of renovated car oil were used for each pound of new-cotton waste.

The test machine consisted of a standard 5½-in. by 10-in. axle journal, supported by two calibrated roller bearings and connected by a flexible coupling to a 100-amp. 230-volt d. c. calibrated motor, capable of driving the journal at any constant speed from 0 to 100 m. p. h. The load, applied by a large handwheel through reduction spur gears and a spring-supported connection to the end of the lever arm, was measured and kept constant at the desired point through the use of a Fairbanks scale.

As a result of this series of tests, the Committee on Journal Bearing Development reported substantially the same laboratory performance at various speeds under full rated rail load for both the modified and the standard journal bearings. They found that journal bearings having linings properly machine broached, other things remaining the same, give outstandingly better performance than the same bearings having as-cast unbroached linings. This is borne out by the much smoother power curve for broached bearings, shown in one of the charts. The committee also found that journal bearings with depressed backs under the same conditions give im-



A. A. R. journal bearing with plain back—Left: Back machined flat—Right: Typical center loading with 8.08 sq. in. of bearing area after test



A. A. R. modified journal bearing with depressed back—Left: Two pads machined flat—Right: Typical two-point loading with 7.87 sq. in. of bearing area after test

proved overall performance in relation to the journal and the wedge, as compared with the same bearings having plain non-depressed backs. The definitely higher operating temperatures of plain-back bearing at various speeds are shown in a second chart.

Based on the salient facts established through the Series A tests, the committee made two specific recommendations, designed to conserve strategic metals by further direct reductions in weight per bearing and at the same time affect an indirect conservation by reducing operating delays from overheating due to newly-applied bearings: (1) That the practice of applying car journal bearings with as-cast linings be discontinued and all new railway car journal bearings have linings machine-broached to a proper bearing surface with the minimum thickness allowable under modified design, then known as the D-23 1-15-42; (2) that the depressed-back detail, shown as an alternate design of the modified bearing, shall be specified on orders for all new bearings purchased to the modified design during the present emergency.

Reduced Thickness of Bearing Back and Lining

In the third bulletin, issued May 15, 1942, the Committee on Journal Bearing Development recommended and the General committee approved another emergency bearing D-23 5-29-42 with reduced weight over the previous modified bearing by decreasing the thickness of the back and the lining wall within the limits established as possible through the laboratory tests and practical to manufacture with the present machine tool and fixture equipment available for making railway car journal bearings. No changes in the pattern for the modified bearing design earlier proposed were necessary.

The object of the investigation reported in the third bulletin was to explore the possibilities of a further curtailment of strategic material by decreasing the thickness of the back and the lining. A total of 32 Series B test rums were made with three different size bearings, namely, (a) bearings tested on a nominal 5½-in. diameter journal; (b) bearings tested on the same journal turned down to 5 in. in diameter; and (c) special tests of a shortened bearing on the 5½-in. nominal diameter journal.

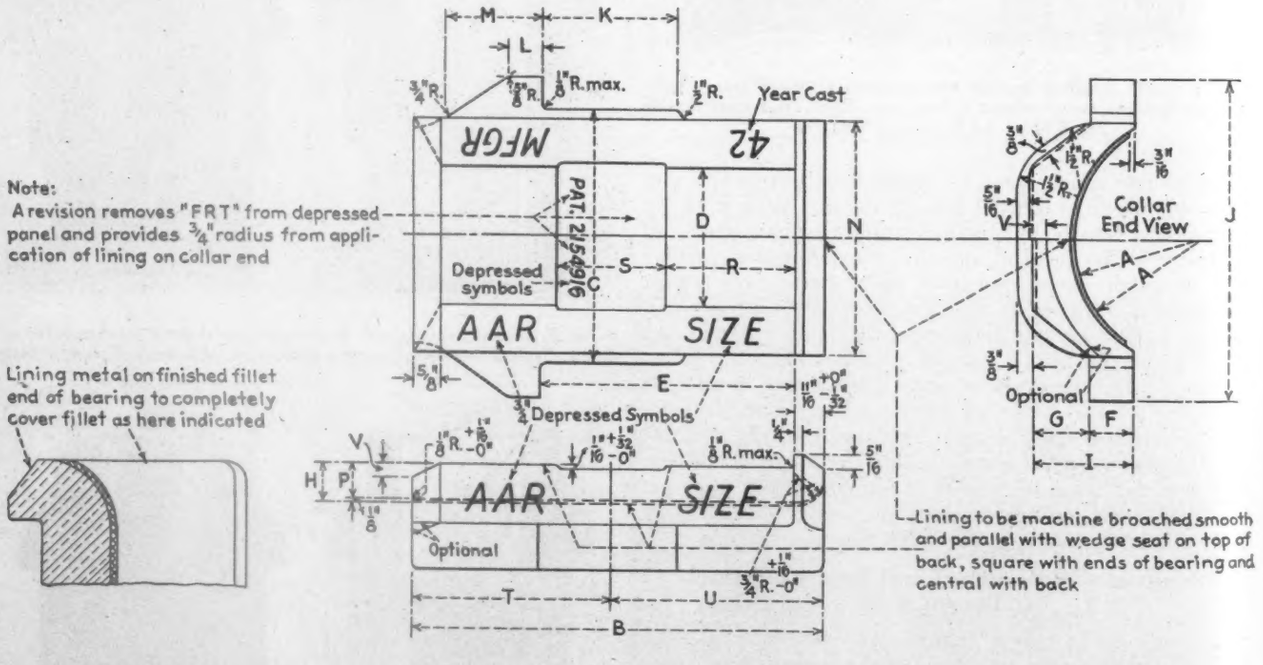
All test bearings were 5½ in. by 10 in., with A. A. R. bronze backs and babbitt linings, made by the National Bearing Metals Corporation. The shortened bearing was reduced ¾ in. in length at the lug end and used for the purpose of a special test.

The Series B test procedure called for a continuous run for eight hours under 16,375 lb. total load at 40 m. p. h. and a similar run at 80 m. p. h., or 16 hours total run with an over-night cooling-down period between each 8-hr. test. The same proportions of packing, renovated car oil and new dry-cotton waste were used in the Series B as in the Series A tests.

The test machine was the same as that previously described. The temperatures of the journal and the bearing were measured at 90-sec. intervals and recorded on temperature charts. Changes in position of the bearing in the horizontal plane and of the assembly (bearing plus axle) in the vertical plane, due to load and heat generated, were measured by means of special deflection gages.

Conclusions Reached

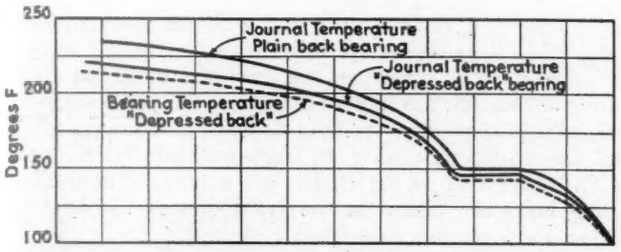
As the result of the Series B tests, the general conclusions were drawn regarding both A. A. R. standard


Note:
A revision removes "FRT" from depressed panel and provides ¾" radius from application of lining on collar end
Lining metal on finished fillet end of bearing to completely cover fillet as here indicated
Depressed symbols
Year Cast
MFGR
42
PAT. 2154916
AAR
SIZE
Collar End View
Optional
Lining to be machine broached smooth and parallel with wedge seat on top of back, square with ends of bearing and central with back

DIMENSIONS IN INCHES

Class	Size of Journal, in.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V
A	3¼ x 7	1 3/32	6½	4½	2	4 5/16	7/8	1 3/8	3/16	2	5½	2¾	½	1 5/8	3¾	11/32	1 1/16	2	3½	3 3/16	1/4
B	4¼ x 8	2 3/32	7½	4 5/8	2 5/16	4 5/16	1 1/32	1 3/8	3/16	2½	5 7/8	2¾	5/8	1¾	4 5/8	11/32	2 1/16	2¼	3 5/8	3 7/8	1/4
C	5 x 9	2 3/32	8½	5 5/8	3 1/8	5 5/8	1 1/32	1 1/32	3/16	2¼	6 7/8	3 1/8	5/8	2 1/16	4 5/8	3/8	2 1/16	2½	4½	4 5/8	3/4
D	5½ x 10	2 3/32	9½	5 7/8	3 1/2	5 7/8	1 1/16	1 5/16	3/16	2 5/8	7 3/8	3 1/8	¾	2¼	5 3/8	3/8	2 1/16	2½	4 5/8	4 7/8	3/4
E	6 x 11	3 3/32	10½	6 7/8	3½	6 5/8	1 1/4	1 1/2	1 1/16	2¾	8 3/4	4	5/8	2 7/16	6¼	3/8	3 5/8	2¾	5 1/4	5 3/8	3/4
F	6½ x 12	3 3/32	11½	7 3/8	4	7 5/8	1 5/8	1 3/8	1 5/8	3	8 3/4	4	⅞	2 5/8	6½	1 1/16	3 1/2	3 3/8	5 5/8	5 7/8	3/4
PERMISSIBLE VARIATIONS																					
Plus		1/32	1/32	1/32	1/32	1/16	1/32	0	1/32	...	...	...	...	...	...	1/32	...	...	...	...	...
Minus		1/32	1/32	1/32	1/32	1/32	1/32		1/32	...	...	...	...	...	...	1/32	...	...	...	...	...

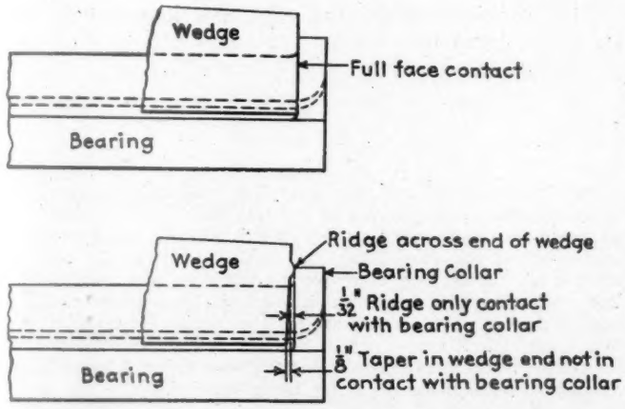
The present revised A. A. R. modified emergency bearing D-23 5-29-42-A which conserves strategic metals



Curves showing higher operating temperatures of journal with plain-back bearing as compared with one having a depressed-back bearing—Temperature of the bearing itself also is proportionately reduced

and modified journal bearings having bronze backs and babbitt linings that reducing the lining thickness is beneficial to lowering the running temperature; and that reducing the thickness of the back to the minimum for relined bearings results in no appreciable decrease in load-carrying capacity or increase in running temperature.

Based on these conclusions, the committee made the following recommendations: (1) that the design of the A. A. R. modified bearing be changed to reduce the weight of both the backs and the linings through the dimensional and tolerance changes shown in drawing D-23 5-29-42A which has been included in the Mechanical Division Manual of Standard and Recommended Practice; and that (2) in the interest of the national emergency and the necessity for the conservation of strategic metals in car journal bearings the changes incorporated in the proposed design modifications should be put into effect at once.



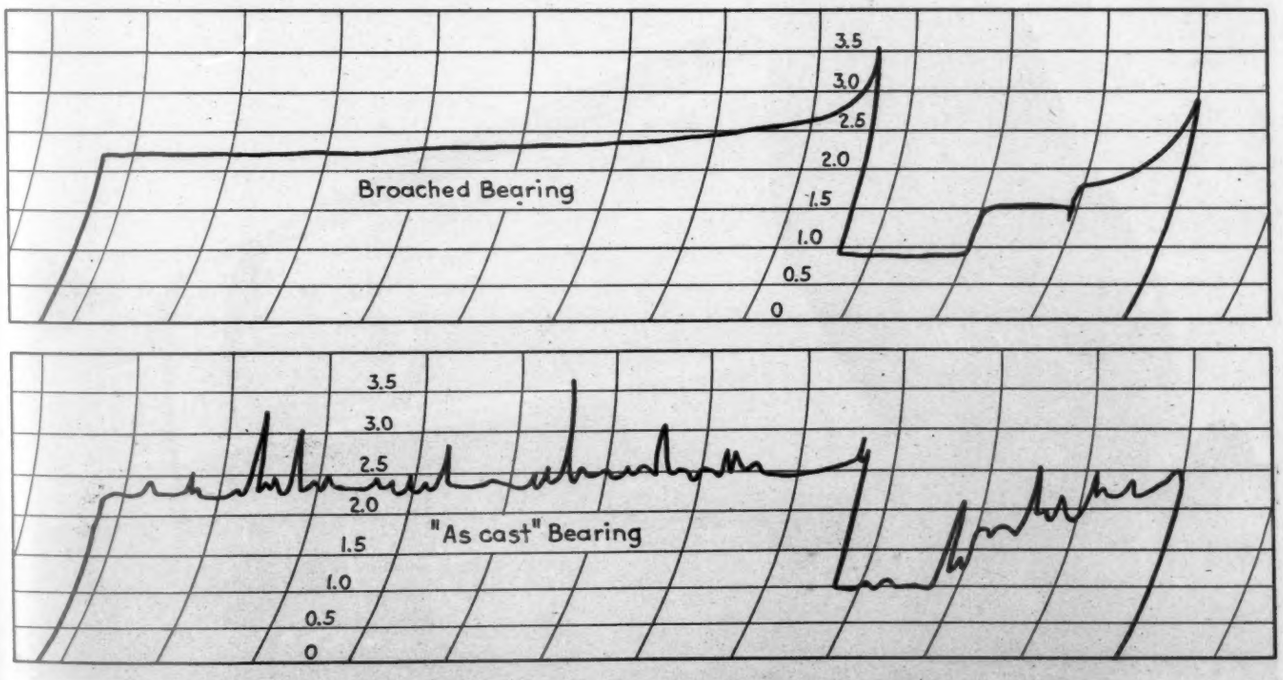
Above: Good practice, with standard-length square-end wedge which places the bearing collar in shear only—Below: Prevalent bad practice, with collar in bending stress due to ridge and taper on the wedge end

Southern (England) Mixed Traffic Locomotives

The Southern Railway of England is building a class of ten three-cylinder single-expansion locomotives of the 4-6-2 type in which are incorporated a number of features not regularly employed in British practice. These locomotives, which are intended for passenger and freight service, are streamlined or "air-smoothed" and are known as the Merchant Navy class. Each locomotive bears the name of a British shipping line, the house flag of which is included in the decorations on the side of the locomotive casing. The locomotives carry a boiler pressure of 280 lb. per sq. in. The driving wheels are 74 in. in diameter and the tractive force 37,500 lb.

The casing enclosing the engine is carried on the main frame and the boiler is free to expand inside of it. It is fabricated by electric welding from rolled sections and 1/16-in. steel sheets. The cab is a continuation of this casing and, like it, is carried on the frames.

The casing in front of the smokebox door acts as an air collector. An opening over the smokebox door forms the mouth of a funnel, tapering to a narrow slot around the stack, through which a stream of air is discharged



Smooth power curve for broached bearing (top) and relatively rough curve for as-cast bearing (bottom)—Major disturbances in the latter indicate momentary metal-to-metal contacts with possible lubrication failure and resultant overheated bearing

upward at high velocity to act as a smoke elevator. Between the frames in front of the smokebox there is an electric-light turbo generator and two mechanical lubricator pumps. These are said to be the first English locomotives to be completely lighted by electricity.

The Principal Dimensions and Weights of the Southern Railway of England 4-6-6-4 Type Mixed Traffic Locomotives

Year built	1941-42
Service	Fr. and pass.
Rated tractive force, lb.	37,500
Weights in working order, lb.:	
On drivers	141,100
On trailing truck	31,360
On front truck	34,720
Total engine	207,200
Tenders	112,000
Driving-wheel diameter, in.	74
Wheel bases, ft.-in.:	
Driving	15–0
Engine, total	36—9
Engine and tender	59—6
Cylinders, number, diameter and stroke (in.)	3—18 x 24
Valve-gear type	Bulleid
Valves, piston type, size, in.	11
Maximum travel, in.	6¼
Boiler pressure, lb.	280
Diameter first ring inside, in.	69¾
Thermic syphons, no.	2
Tubes, number and diameter, in.	124—2¼
Flues, number and diameter, in.	40—5¼
Length over tube sheets, ft.-in.	17—0
Grate area, sq. ft.	48.5
Heating surfaces, sq. ft.:	
Total evaporative	2,451
Superheater	822
Combined evaporative and superheater	3,273
Tender:	
Water capacity, Imp. gals.	5,000
Coal, long tons	5

The boilers of these locomotives have steel inside fireboxes and are fitted with two Thermic syphons. Both the inner and outer fireboxes are welded.

All of the wheel centers, both engine and tender, are patented double-disc steel castings. The driving wheels are fitted with clasp brakes.

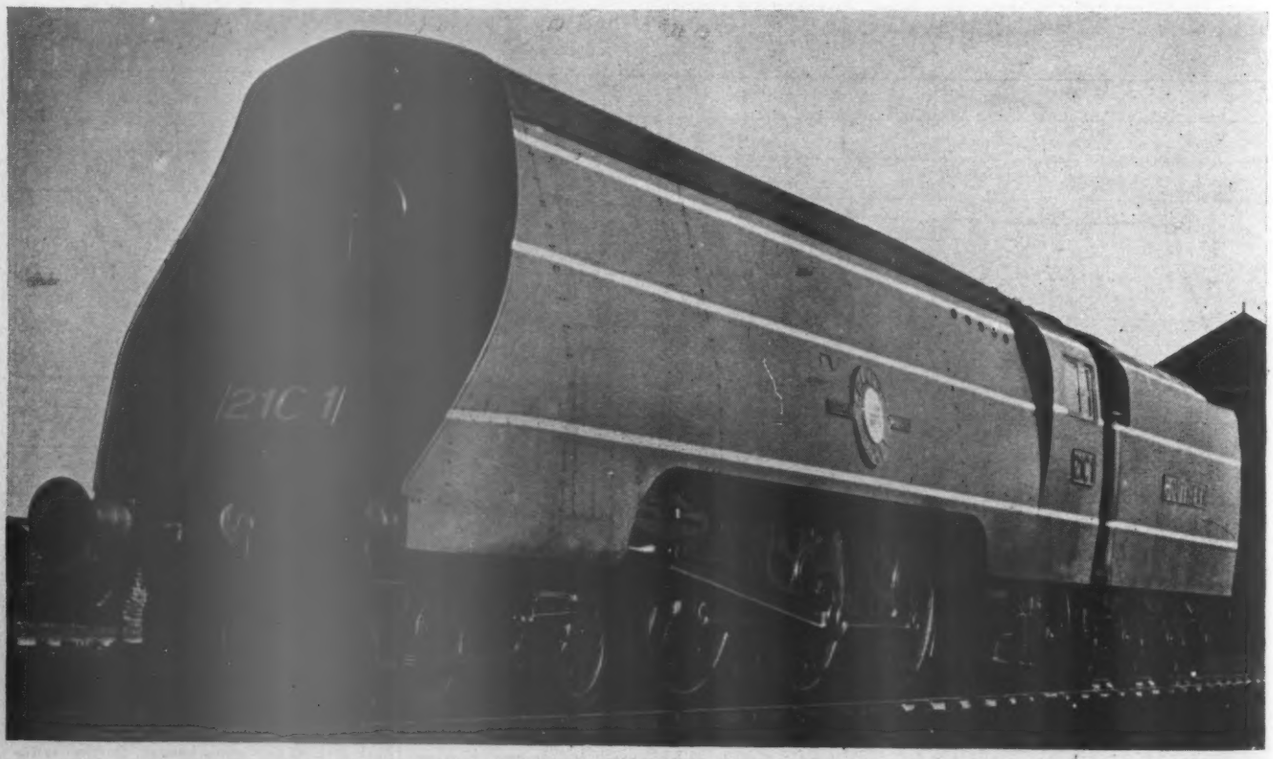
Among the innovations in these locomotives are a power-operated reverse gear and a steam-operated fire door. The locomotives are fitted with the Bulleid patent valve gear. The three sets are enclosed in an oil-tight casing inside the locomotive frames. This also encases the middle connecting rod, crosshead, and crank. All bearings within the casing are force-feed lubricated.

The tenders above the frames are welded. The water-filling holes are placed at the front end of the tender. These are accessible through covers in the tender cab at each side and make it unnecessary for the fireman to climb out over the top of the tender to take water.

The locomotives are numbered in accordance with a new system of notation of the Southern Railway. This gives both the number of the individual locomotive and an indication of the locomotive wheel arrangement. The number of driving axles is indicated by a letter of the alphabet, in this case "C" for the three pairs of driving wheels. The first numeral indicates the number of carrying axles in front of the driving wheels and the second the number of carrying axles behind the drivers. The final numeral is the serial number of the locomotive in the class.

The principal dimensions of these locomotives are shown in the table.

OIL LOADINGS BREAK RECORDS.—The railroads continue to break records in hauling oil to the east coast. On August 1 a new plan was inaugurated setting up schedules for the established routes which eliminate delays in yards and terminals and at interchange points. Cars are moved in blocks and solid trains. Returning empties are handled in much the same manner as the loaded movements. According to Petroleum Coordinator for War Harold L. Ickes, a new record for rail shipments reaching the seaboard was established during the week ended August 15, an average of 830,820 barrels a day being handled.



The "Channel Packet" of the Southern Railway of England

EDITORIALS

Reclamation Vs. Economy

The extent to which the war spirit of getting things done regardless of cost has spread from our national government through general industry and the railroads is indicated by the following comment of a responsible car department officer, who said: "We're extremely busy here trying to do a first-class job and succeeding pretty well, with bad orders down to about two or three per cent. But it sure keeps a fellow scratching his head to provide material; saving this; repairing that; and substituting one material for another. Fortunately, we have been pretty well organized and equipped for economical reclamation in the past, but now it is *reclamation* and to heck with *economy*—Keep Them Rolling—and we certainly do."

Your Responsibility To Our Country

A peculiar American trait is that of indifference to the things that do not seem to be of immediate and personal concern. This characteristic has been called by a number of names. In one of its forms it is labeled "buck passing"; a variation of this is the "let George do it" attitude and now, with the war on, it comes up with a new, and somewhat high-brow name—complacency.

The accusation that the American people are complacent in these serious times has brought forth a storm of protest from some quarters and the good, old-fashioned American silence from the other 90 per cent. Those who rise in protest demand to know, "who's complacent—and about what?"

These columns are not, of course, the place to take up a consideration and attempted solution of the affairs of the world. During business hours at least, we can assume that someone else is charged with that responsibility. Our interest at the moment is the affairs of the railroad industry, and specifically the problems of the mechanical department, for in that small sphere of activity there are several things that none of us can afford to be indifferent about, no matter how much we may be inclined to think that they are of no personal concern. There are things going on that every railroad man should know about and, having been informed, do something about; upon such decision and action may depend a very important matter having a major influence upon the winning of the war—the successful functioning of rail transportation.

In order to appreciate certain facts relating to the railroad business and the manner in which you can play an individual part it may be well to remind ourselves of these things:

(1)—At the outbreak of this war, just as in 1917, the necessity of setting up governmental agencies charged with the prosecution of the war effort caused a segregation and classification of the users of materials and industrial products which, in a broad sense, resolved itself into two major divisions, military and civilian. The railroads, along with most industrial organizations, automatically fell into the latter group. Gradually, however, many industries, such as the automotive, were converted to defense work and in the minds of government representatives ceased to be civilian and became military. The railroads, however, were not "converted" and thereby remained in the civilian category.

(2)—In order to make sure that first things came first and that critical materials went where they were needed most in the shortest possible time the government set up OPM and the priorities system. Priorities are still with us but OPM is now WPB.

(3)—Under the priorities system it was but natural that materials and supplies should, in the early months of preparation at least, go to the military establishment and that civilian needs would be of secondary importance. Under such arrangement the railroads had, and are still having, difficulties in getting what they need.

(4)—The major importance of aircraft to the fighting forces removed the immediate threat of air transport as a competitor of the railroads and the activities of the Japs in the Far East literally pulled the "feet" out from under our major competitors, the bus, truck and private automobile, all of which coupled with a wartime industrial effort has thrown onto the railroads a traffic burden that was not anticipated and for which they were not in all respects fully prepared.

(5)—In the nine months we have been at war the railroads of this country have done one of the most remarkable jobs in all their history and are now handling freight and passenger traffic in a volume that is exceeding pre-depression highs with far less equipment than they had, for example, in 1929. This statement is *not* made to record, with pride, an accomplishment but to serve as a warning of unpleasant things that may happen if the proper steps are not taken.

(6)—No sane-thinking person could help but be soberly conscious of the rapidly growing importance of the railroads to the war effort. Certainly they're not part of the fighting forces but there could easily come a time when the fighting man at the front would be impotent unless food and the ammunition for his guns can be moved to the transport's dock when and in such quantities as it is needed for the job at hand. In this respect there might easily develop a situation in which rail transport would be of equal importance to the mili-

tary establishment. For, without the one, the other is helpless.

(7)—The warning in the previous paragraph is issued because of a certain fact about which too many people in both railroad and government circles may be indifferent—call it complacency, if you wish—and that is that never in all the history of railroading has equipment been operated under such pressure and worn out at the rate that it is today. Certainly, modern power is making it possible to haul heavy train loads at passenger-train speeds. On many roads as little as one-third of the motive power is handling from 50 to 60 per cent of the freight and passenger traffic. The truth of the matter is that without this modern power the job just couldn't be done at all. However, the important point is *the rate at which equipment is being worn out.*

(8)—In ordinary times the railroads experience their major traffic peak in October, with a decided falling off after the peak—in other words, a chance to catch their breath. October, 1941, was such a peak period during which records were made in tonnage handled and in the utilization of motive power. But after the peak of last October there was no breathing spell. Each month since then road after road has experienced traffic increases to the point where many are now at all-time highs—and the process of wearing out equipment still goes on.

(9)—The railroads, in many cases, are doing without equipment and materials that soon will be desperately needed to insure the continuity of the present high-grade service; they are at times being put under pressure by those without knowledge of facts to devote part of their energies to the production of things not related to rail transportation; they are, possibly, being "complacent" about symptoms that indicate trouble ahead; they are, in many cases, assuming that, being good railroaders, they can handle anything that comes along. As to this, the history of the past 24 months is replete with the records of what happened to others who felt the same way.

So, what can be done about it? Just this! Don't guess, know! If you mechanical men haven't got what you're going to need to put all your power through the shop in double-quick time, do something about it, now. If you haven't got the equipment you must have to do a job don't sit around telling yourself there's no use asking because you couldn't get it anyway; ask, yes demand, and keep on asking until you get it or find out why. If WPB or some defense contractor wants a war production job done, don't just arbitrarily decide that you can't do it; find out, without any guesswork, whether you have some excess shop capacity that you could devote to the job and if you haven't got it without interfering with your major job of keeping the railroad running don't be a bit backward about saying "no" and producing the facts to prove your point.

Remember, your responsibility is to keep the railroads running for without them battles may be lost. And, anyone, from now on, who fails to keep in mind how rapidly equipment is wearing out and fails to do something about it while there's still time is not only falling down on the job but—well, you name it.

Move the Cars But Have Them Safe to Move

An ever-present danger in times like these, when cars are moving over the rails more miles per day and, in many cases, at speeds higher than were contemplated when they were designed, with quicker turn-arounds and more urgency in getting them past interchange points, is that the fact may be lost sight of that the A. A. R. Rules of Interchange have not been relaxed in any way that permits the movement of cars not fit for line service to continue on their journeys. It is true that technical violations of these rules might be overlooked in order to permit loaded cars to go to destination if running and draft gear, brakes and safety appliances are in proper order and working condition. In case of doubt, however, on any mechanical or structural question, the best rule for car inspectors is still the rule of safety. Have the defect corrected before the car is permitted to travel further and possibly endanger the lives of members of the train crew or passengers on a passing train. A delayed car may result in inconvenience to the consignee, perhaps even slow down a plant's war production for a matter of a few hours, but a train wrecked because of a defective car will inconvenience and delay many more plants.

We have been assuming that all of the railroads are maintaining adequate and well-trained inspection forces and that there are no orders issued on any of them to encourage car inspectors to relax their vigilance with respect to dangerous defects. That this assumption might not be correct has been evidenced particularly in the observation of spread-side cars on the lines of a number of roads; it has also been noted in the lack of adequate side bearing clearance on cars running on tangent track at train speeds which were not too great to permit accurate observations. Other potential-accident defects are not so readily detected without closer inspection of the cars when they are in a standing position. But, the existence of defects of the nature mentioned suggests that others may also be getting past the inspectors.

There is no intention here to place blame on inspectors or on supervisors or on management. We don't know where the responsibility rests for the conditions apparently existing. We do know that, in the final analysis, it rests on management to determine whether it, itself, is at fault or whether, having provided sufficient working forces and equipment, personnel is not measuring up.

Vital as are the speedy handling and movement of freight cars today there is still no excuse for compromising with safety.

Artificial Material Shortages

Our English contemporary, the Railway Gazette of London, states that, with government control of railways, political interference increases and if "reforms" are promoted in the interests of the entire community they must be accepted when sound in principle, even though apparently somewhat ill-founded from a practical standpoint. Too often, however, such reforms and interference with railway operation are inspired by political motives which are sectional rather than national in interest.

In connection with the reduction of dining-car service in England, for example, any extra space for travelers which might be made available by the withdrawal of these cars would be small and the cars would not be easily adaptable to other service, consequently occupying storage track space better devoted to other useful purposes. The Gazette goes on to say that, in some political circles, there seems to be a tendency to interpret equality of sacrifice in terms of the greatest discomfort to the greatest number, and not to bother too much as to whether in achieving that end any practical advantages accrue.

It cannot be questioned that in this country, also, many steps have been suggested and actions taken not so essential from a practical standpoint as aimed at the objective of making the public generally, and railroad men in particular, "war conscious." That goal has now been achieved and from this time on it seems obvious that restrictions on equipment and material use should be limited to actual necessities, as determined by accurate balancing of what is actually available against the needs.

More Fusion Welding Of Cast Iron

It is estimated that about 90 per cent of all cast-iron welds are now made with the use of bronze welding rods, this method being generally popular and widespread in application because the welds are easy and economical to make and also show desirable physical characteristics as regards strength and ductility. Bronze welding is not always feasible, however, owing to the color difference, due to the fact that the castings may be subjected to high temperatures, or, more recently, because of scarcity of the bronze welding rods which are available only for work having a high priority rating.

Welding operators in railway shops are thoroughly familiar as a rule with bronze welding procedure in the repairing of defective gray iron castings but most of these welders have had relatively little experience in the fusion welding method which involves veeing out and melting the cast iron at the edges of the crack or other defect and filling in with additional molten iron from cast-iron welding rods. In order to secure satisfactory results in the fusion welding of cast iron, it is necessary for the welding operator to know something about the grade of casting to be welded and also have some idea of its chemical composition and physical properties so that he may understand how the application of heat will affect these properties and consequently be in a position to use the correct welding procedure.

Commercial cast irons, with about 93 per cent iron, 3 to 4 per cent carbon, and small proportions of other elements such as silicon, sulphur, manganese and phosphorous, include white cast iron with a white fracture which is difficult to file; gray cast iron with a grayish-black fracture which can be easily machined or filed; malleable cast iron which has a lighter fracture at the surface and can be easily machined and moderately bent without breaking; and alloy cast irons which may be any one of the three types previously mentioned and must usually be referred to the manufacturer for recommendations regarding chemical composition and necessary heat treatment.

In addition to some knowledge of the metallurgy of cast iron, especially the effect of carbon on its physical properties, and how to identify the different grades of cast iron, it is important for operators to learn how to prepare the defective surfaces for welding, provide for expansion if required, decide what degree of preheating is necessary, control the flow of metal without under or overheating and see that the rate of cooling or annealing is such as to give the best physical properties obtainable with each particular type of casting. Some railroads have already made real progress in training welders for a more general use of cast-iron welding rods and it is apparent that this training program should be extended.

New Books

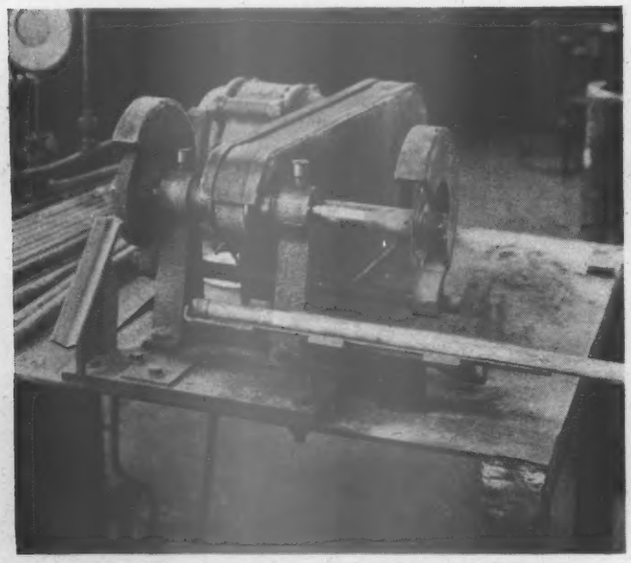
MECHANICAL ENGINEER'S HANDBOOK. FOURTH EDITION. *Edited by Lionel S. Marks. Published by the McGraw-Hill Book Company, Inc., New York. Sixteen sections. 4¾ in. by 7 in.; bound in red leather. Price, $7.*

Most of the sections of the fourth edition of Mark's Handbook have been completely rewritten in order to include the more important knowledge and points of view on standardization of machine elements, of material, and of processes which have been developed by engineering societies and other organizations since the 1930 edition. Among the new subjects are the theory of models, plastic behavior of materials, stress concentration, creep, packings, wind pressure on structures, sound and noise, automatic control of processes, and powder metallurgy. By the exclusion or condensation of matter which has become, or is becoming, obsolete, and by omitting the condensed statements of the A. S. M. E. Power Test Codes, the work has been kept within a single volume.

Reclaiming Copper Tubes By Welding

Before the present acute shortage of copper it was customary on one large railroad to scrap the copper tubes removed from electric locomotive heating boilers at the time of the required four-year inspection of the boiler interiors. Now they are reclaimed by welding. In removing these tubes they are drilled out of one tube sheet and cut off from the tube sheet at the opposite end of the boiler. The copper tubes, originally ¾ in. by 36 in., are of a length which is of no value in any other application to any of the railroad's equipment. In the center of one of the illustrations is shown the condition of the ends of these tubes when they are removed from the boilers. On the right are shown tubes as prepared for welding; on the left they are shown as welded.

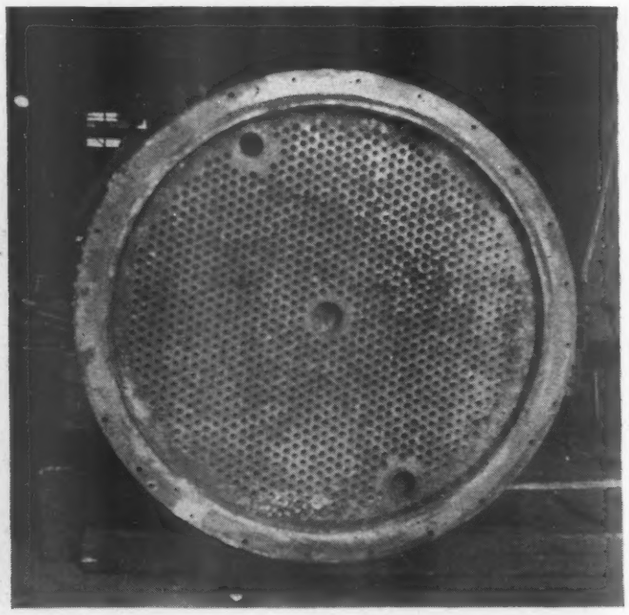
As it became impossible to obtain the number of copper tubes required for installations—there are 1,250 in each boiler—the railroad's supervisor of welding and other of the mechanical department officers considered the possibility of reclaiming the tubes by safe-ending. Experimental operations were so successful that a shop unit was set up to handle the reclamation on a production basis. At the present time about 80 per cent of the tubes removed are returned to service after being safe-ended and properly tested at the working pressure of the boilers, 250 lb. per sq. in.



Cut-off saw and grinding wheel for beveling the tubes and safe ends

The wire brush and burnisher used for cleaning the finished tubes

Ram for straightening the tubes



Top tube sheet of one of the locomotive heating boilers

The first operation after the tubes are received from the boiler shop is the straightening of each on an air-operated ram. This ram is the exact diameter of the inside of the tubes and not only serves to straighten them but removes any dents in the walls. After straightening, the defective ends are cut off with a motor-driven metal saw. A 45-deg. bevel is ground on the end of the tube to be reclaimed as well as on the safe ends.

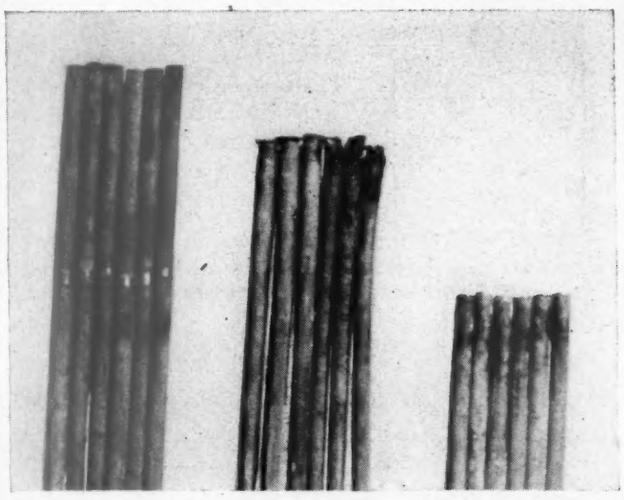
The safe ends are welded on by the oxyacetylene process using a bronze rod with the proper flux suitable for application on copper. The operator is able, through the use of a pedal-operated jig to revolve the tube as he holds his torch and rod in a single steady position.

The jig is clearly shown in one of the illustrations. Depressing the foot pedal raises the counterweight through the action of an eccentric arm extending from the pedal to a drum over which runs a wire that has

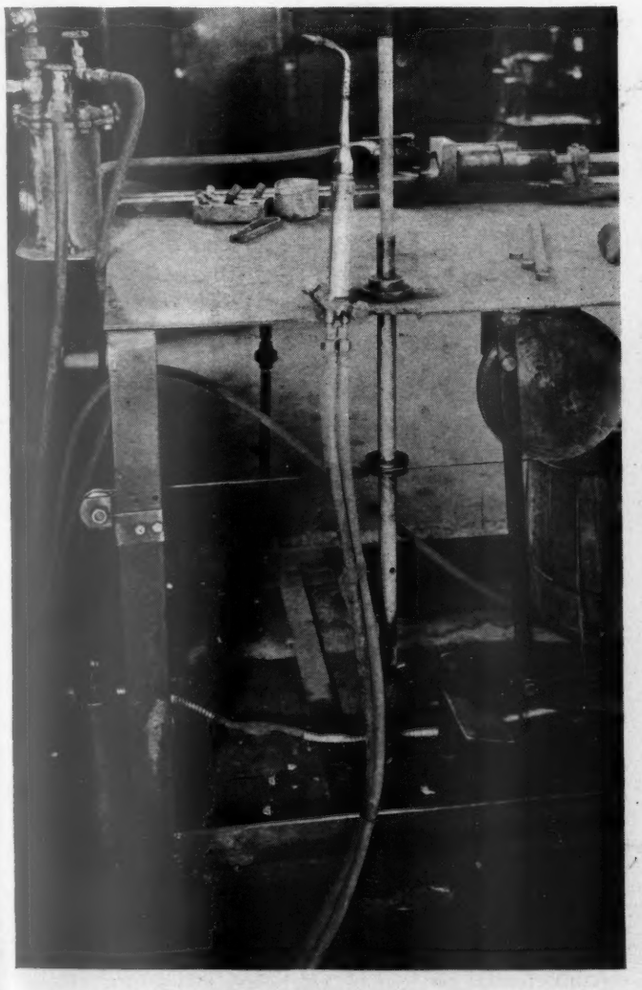
been passed completely around a small operating wheel welded to a freely-rotating spindle. The two pieces to be welded are mounted on this spindle. A flux tank is conveniently located for the operator, as are the valves for the acetylene and oxygen lines.

After welding, all tubes are given a working pressure hydrostatic test of 250 lb. per sq. in. When this test has been satisfactorily met the tubes go to a workman who, using a motor-driven wire brush, removes all scale and oxidation from the entire outside tube surface and finishes the polishing operation on a burnishing wheel.

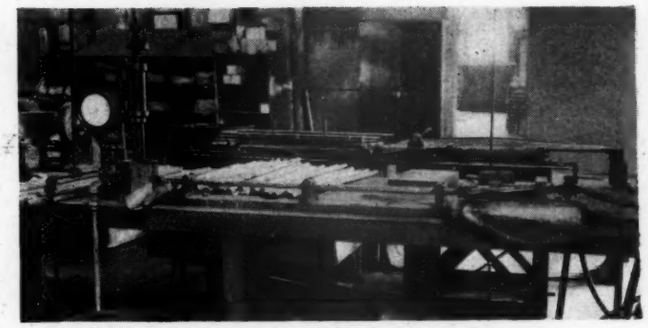
This reclamation project has made it possible to return boilers to service promptly which might otherwise have been held up for lack of necessary materials.



Safe-ending copper tubes—Center: Tubes as removed from the boiler—Right: Ready for welding—Left: Safe ends welded on



The jig in which the welding is done



Hydrostatic-testing bench

A Horizontal Driving-Box Press

A horizontal driving-box press which has certain advantages over the vertical press ordinarily used, is shown in the illustration. It consists essentially of an old driving-wheel press, no longer adequate for mounting modern large driving wheels and axles and adapted by means of special equipment for the convenient removal and reapplication of bearing brasses in driving boxes.

An old driving-wheel press adapted for removing and re-applying driving-box brasses

The driving box rests and can be easily moved on a steel-face block about 20 in. above the shop floor and having steel parallel bars of various thicknesses to support driving boxes of different size so they will come

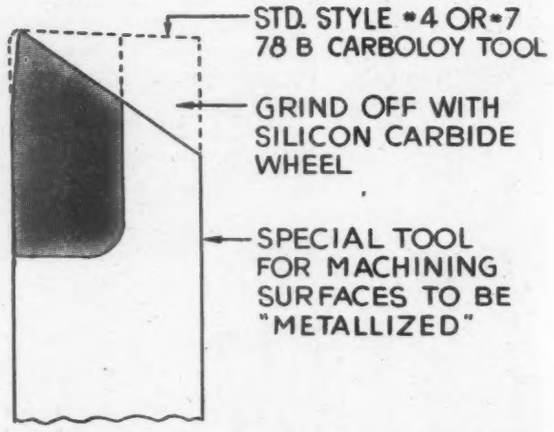
at the correct height for pressing the brasses in or out. Two vertical 3-in. steel posts are located one on either side of the ram at the head of the machine. They are solidly anchored at the bottom to the base plate of the machine and firmly secured at the top by means of a heavy steel bracket bolted to the top rail.

A close examination of the illustration will show two substantial forged-steel jaws or clamps, which pivot on the 3-in. vertical posts and may be readily swung inward to engage the driving-box flanges when pressing a brass in or out, or swung back out of the way when the operation is completed and it is desired to put another driving box in place. The illustration shows these jaws swung back ready for placing another driving box in the machine. The machine has more than ample capacity to apply brasses in the largest driving boxes at pressures shown on the indicating gage.

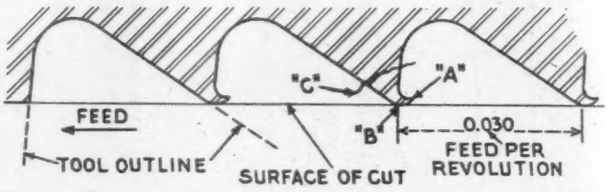
"Incorrectly" Ground Tools Produce Desired Results

Proper preparation of surfaces prior to metal spraying is readily done on hard-to-machine alloy steels, according to engineers of the Carboloy Company, Inc., by violating previously closely-adhered-to standards of tool preparation. Metal-spraying requires that the surface upon which metals are to be deposited shall be rough so that a proper bond will be formed between the parent metal and the metal being used to build up the piece in process. Difficulties were encountered in machining alloy steels to give a rough finished surface even when the best and most expensive of tool steels were employed; tool life was short and the cost of preparation was high.

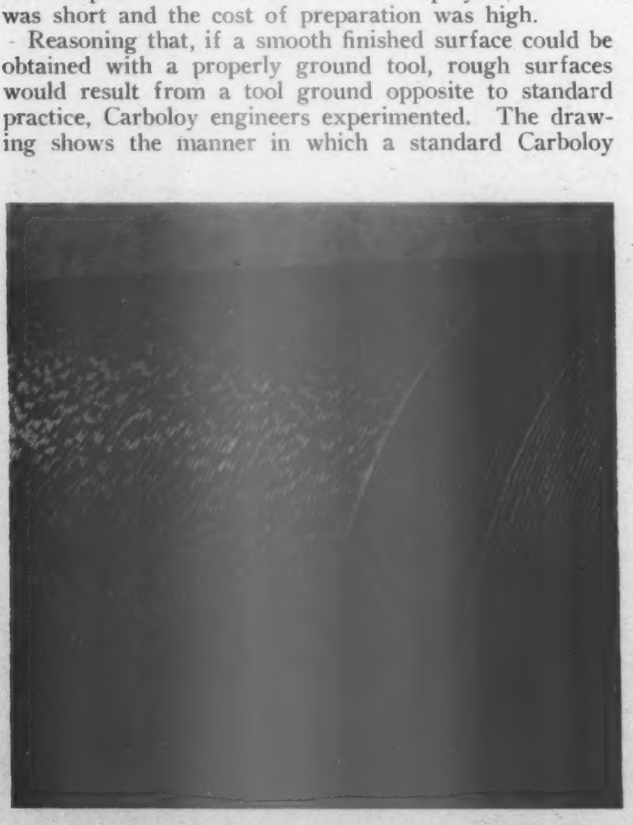
Reasoning that, if a smooth finished surface could be obtained with a properly ground tool, rough surfaces would result from a tool ground opposite to standard practice, Carboloy engineers experimented. The drawing shows the manner in which a standard Carboloy Style 4 tool was ground and the photograph shows the actual results obtained. The other drawing is an enlarged view of the cut. At a feed of 0.030 in. and with a cut of 0.020 in. an ideal surface for metal-spraying was obtained. The "incorrectly ground" tool raised a burr between tool marks and the tool angle was such that it forced the burrs over into a horizontal position. Uneven crests were raised and a mottled surface produced as an ideal base for the adhesion of sprayed metal. Cutting speeds were around 200 surface feet per minute.



Tool grinding for preparation of parts to be metal sprayed produces best results when tools are "incorrectly ground"



With incorrectly ground tools crests are lifted intermittently, at as "C" to produce an uneven surface to which sprayed metal will bond



An ideal surface for the application of sprayed metal is obtained when "incorrectly ground" tools are used. The surface on the left in the illustration will give the desired bonding between parent metal and sprayed metal

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Patching a Grooved Seam

Q.—What type of patch should be applied for reinforcing the shell course of a boiler because of grooving at the circumferential seam?—F. B.

A.—A typical patch for strengthening the shell course of a boiler to overcome a weakened condition caused by grooving along the circumferential seam is shown in the drawing.

The thickness of the patch should be the same as the thickness of the shell course to which it is applied. The circumferential portion of the patch, distance *A*, in the drawing should have the same size rivets and rivet spac-

ing as the circumferential seam to which the patch is applied. The distance *A* should always be longer than the grooving in the shell.

The ends of the patch should be designed in the same manner as those for a diamond patch. The efficiency of the ends should be at least equal to the efficiency of the longitudinal seam of the course to which the patch is applied. The efficiency of the seam along the outer row of rivets for distance *C* is computed by the formula:

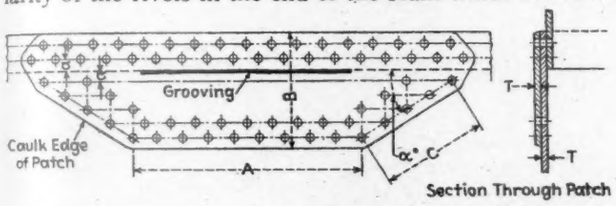
$$\frac{2\ (P - D)}{P\ \sqrt{3 \times \sin\ (\alpha)^2 + 1}}$$

where

P = pitch of rivets in outer row, in.
d = diameter of rivet hole, in.
α = angle, deg.

In designing the ends of the patch care should be taken so that the pitch of the rivets permits proper caulking.

The width of the seam *B* is determined by the angularity of the rivets in the end of the seam which is neces-



Circumferential seam patch to strengthen area after grooving

sary to obtain the required efficiency. The first row of rivets in the patch adjacent to the circumferential seam should be spaced the same distance away from the circumferential seam as the rivets in the circumferential seam are spaced from the edge.

The Remedy for "Cool Down" Leaks

Q.—What are the causes and remedies for "cool down" leaks that appear in locomotive fireboxes around staybolt heads; that is, fireboxes which are tight in service and develop leaks upon standing and cooling down?—J. F. J.

A.—The cause is the expansion and contraction of the boiler which causes the staybolts to work in the sheet, resulting in leaky staybolts. Staybolts that leak slightly when the boiler is cool will tighten when the boiler is under pressure, due to the expansion of the boiler; also the staybolts that have been working in the sheet while the boiler is under pressure often will not show any signs of leaking until the boiler has cooled down.

This condition may also be caused by a rapid change in the firebox or boiler temperature due to the following:

1.—On stoker-fired engines, due to the light fire carried, the fire dies down rapidly when the engine is brought on the ash pit after a run, large holes forming in the fire allowing cold air to enter the firebox.

2.—The use of the injector by the hostler, putting cold water into the boiler.

3.—The opening of the fire door, while dumping the fire when over the ash pit.

4.—Using the blower while the engine is over the ashpit.

All of the above are common practices that tend to cause rapid changes of temperature in the firebox with its resultant effect on the firebox sheets and staybolts.

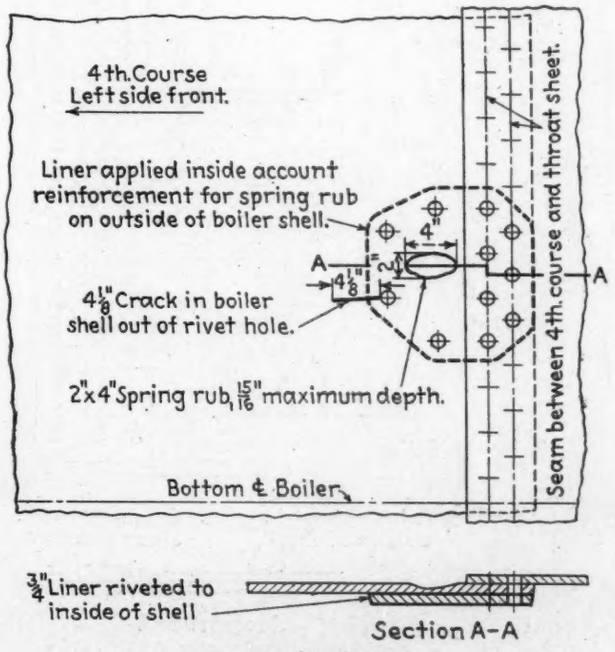
Care taken in cooling down a locomotive after a run eliminating as far as possible any rapid change in the temperature of the boiler will reduce staybolt leakage. Water treatment and continuous blowdowns are generally accepted as the best remedies for the prevention of leaky staybolts and cracked side sheets.

A Boiler Patch Calculation

By L. R. Haase

The patch shown was applied on the left side of the fourth course of a boiler shell which had previously had a liner applied on the inside of the boiler to reinforce a point worn by a rubbing spring. At a later shopping of the locomotive a crack in the boiler shell was discovered running from one of the rivet holes used in the application of the liner. It was decided to remove the liner and apply an outside patch as protection to the spring-worn spot and reinforcement for the crack.

A ⅜-in. hole was drilled at the end of the crack to prevent its further progress into the shell, the outside throat sheet was scarfed and the rear circumferential edge of the patch was set to suit the scarfed sheet. In order to utilize holes previously drilled in the boiler shell for the inside liner it was necessary to design a patch of rather unusual shape. However, it has the necessary factor of safety as shown by the calculations.


4th. Course
Left side front.
Liner applied inside account reinforcement for spring rub on outside of boiler shell.
4"
A
2½"
4⅛"
A
4⅛" Crack in boiler shell out of rivet hole.
2"x4" Spring rub, 15/16" maximum depth.
Bottom ℄ Boiler
Seam between 4th. course and throat sheet.
¾" Liner riveted to inside of shell
Section A-A

The original inside liner

The actual value of metal lost due to the crack is

$$L \times t \times TS$$

where

L = length of the crack, in. 4⅛ in. + 1 3/16 in. = 5 5/16 in.
t = the thickness of the fourth course, ¾ in.
TS = tensile strength of steel used in the fourth course, 55,000 lb.

5.3125 × .75 × 55,000 = 219,141 lb.

The actual value of metal lost on the spring worn spot is

$$L \times t \times TS$$

where

L = length of the spot, 4 in.
t = thickness of metal lost, 5/16 in.
TS = tensile strength of steel used in fourth course, 55,000 lb.

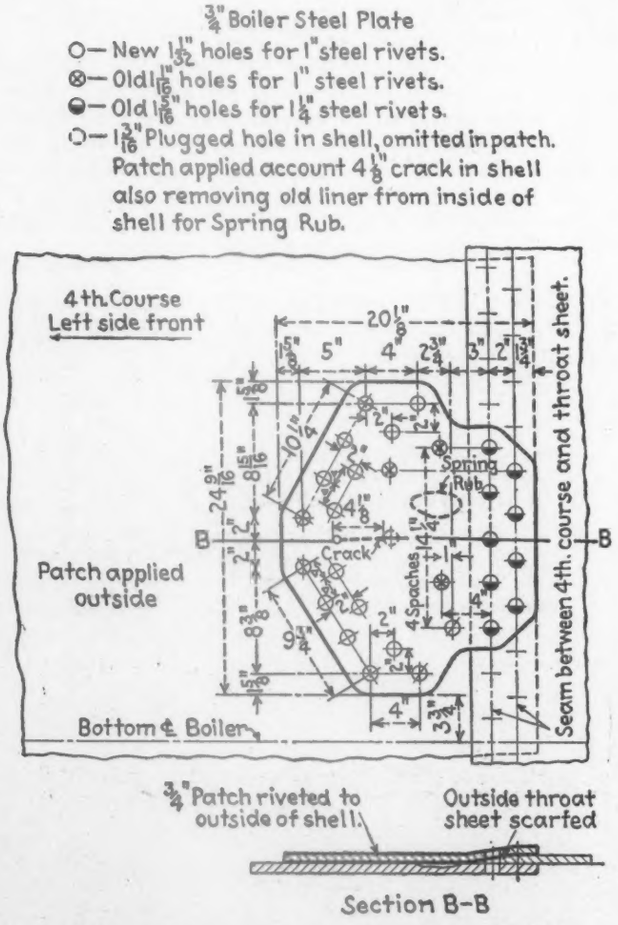
4 × .3125 × 55,000 = 68,750 lb.

Total value of metal lost is the sum of these two or 287,891 lb.

After determining the value of the metal lost the number of rivets in shear required on each side of the patch is found by using the formula

$$N = \frac{\text{Value of metal lost}}{S}$$

where N is the number of rivets required, the value of rivets lost is 287,891 lb. and S the shearing value of one


¾" Boiler Steel Plate
○— New 1 1/32" holes for 1" steel rivets.
⊗— Old 1 1/16" holes for 1" steel rivets.
◒— Old 1 5/16" holes for 1¼" steel rivets.
○— 1 3/16" Plugged hole in shell, omitted in patch. Patch applied account 4⅛" crack in shell also removing old liner from inside of shell for Spring Rub.
4th Course Left side front
Seam between 4th. course and throat sheet.
Spring Rub
Crack
Patch applied outside
Bottom ℄ Boiler
¾" Patch riveted to outside of shell.
Outside throat sheet scarfed
Section B-B

Patch applied over crack and worn spot on boiler shell

steel rivet of 1 in. diameter driven in a 1 1/16-in. hole or 39,010 lb. per sq. in.

$$N = \frac{287{,}891}{39{,}010} = 7.3 \text{ rivets or approximately eight rivets required in single shear.}$$

It will be seen that there are sufficient rivets in shear on the outside patch and that they are placed to allow good caulking. It is necessary to find the efficiency along the angular line of rivets at the front of the patch to make certain that there is efficiency at least equal to the efficiency of the longitudinal seam. Without consideration of angularity the efficiency of the line of four rivets at the top of the patch is found to be 69.8 per cent and the line of four on the bottom of the patch is 68.3 per cent. Additional strength results from the angularity of the rivet lines which is 29 deg. 12 min. for the top line and 30 deg. 51 min. for the bottom line.

The factors for determining additional strength resulting from angularity are found by the use of the formula:

$$F = \frac{2}{\sqrt{3 \times (\text{sine angle})^2 + 1}}$$

the factors are 1.52 for 29 deg. 12 min. and 1.49 for 30 deg. 51 min. Multiplying the efficiency figures arrived at above by the factors now obtained actual efficiency for the top part of the patch is found to be 106 per cent and for the bottom line of rivets 101 per cent. The efficiency along the 9¾-in. bottom line of rivets being the lesser, it is used in the formula to find bursting pressure:

$$\text{Bursting pressure} = \frac{Ts \times t \times E}{r}$$

where

TS = 55,000 lb. per sq. in.
t = ¾ in., thickness of the plate.
E = efficiency of weakest line of rivets, 101 per cent.
r = the radius of the fourth course, 42⅝ in.

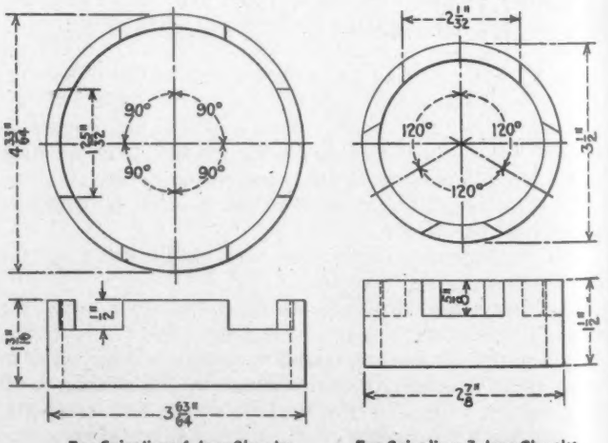
The result 970 lb. per sq. in. is divided by the working pressure of the boiler, 225 lb. per sq. in. and shows the factor of safety for the patch to be 4.31.

Two Devices for Simplifying Lathe Work

By J. R. Phelps*

The drawing accompanying this article describes an idea, the value of which to a lathe operator will be immediately apparent. Any mechanic who has operated a lathe with a four-jaw independent chuck has no doubt often wished for an accurate method of setting the chuck jaws. Such a method is described here and consists simply of marking the ends of the chuck screws so that it is possible to set up hexagon, round, square or octagon work to within .004 or .005 in.

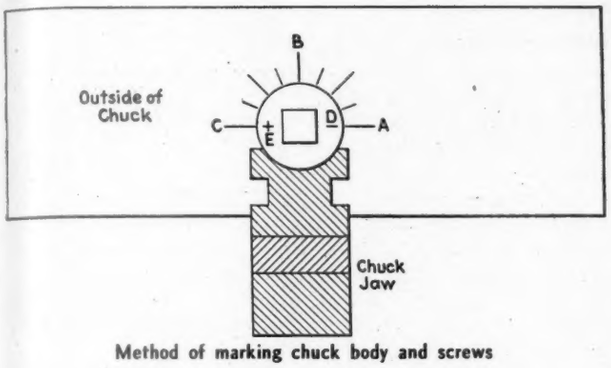
The first thing that must be done is to lay out and file



For Grinding 4 Jaw Chucks — For Grinding 3 Jaw Chucks

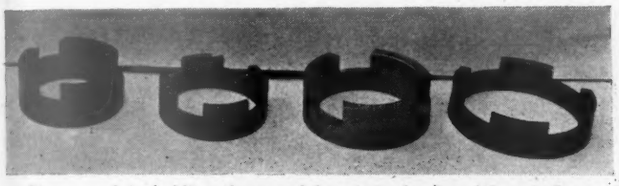
These easily made holding rings simplify grinding on worn jaw faces of lathe chucks

* Machine foreman, Atchison, Topeka & Santa Fe, San Bernardino, Calif.



Method of marking chuck body and screws

or grind the lines *A*, *B* and *C* on the periphery of the chuck body. Next, take any perfectly round piece of steel and chuck it so that it runs within .001 in. of true. This setting should be made with a dial indicator. With the four chuck screws in this position, the straight lines



Rings used in holding three and four jaw chucks while grinding the inside faces of the jaws

indicated at *D* and *E* should be marked on the end of the screw, the line at *D* being exactly in line with the mark *A* on the chuck body and the horizontal line of the cross at *E* exactly in line with the line *C* on the chuck body.

This photograph shows a ring in place on a four jaw chuck which is ready for the grinding operation to restore jaw contour

The chuck screws are now permanently marked and when any piece of work which is symmetrical about the center is placed in the chuck, the marks on each of the four chuck screws at *D* and *E* should be in the same position with respect to the marks *A*, *B* or *C*.

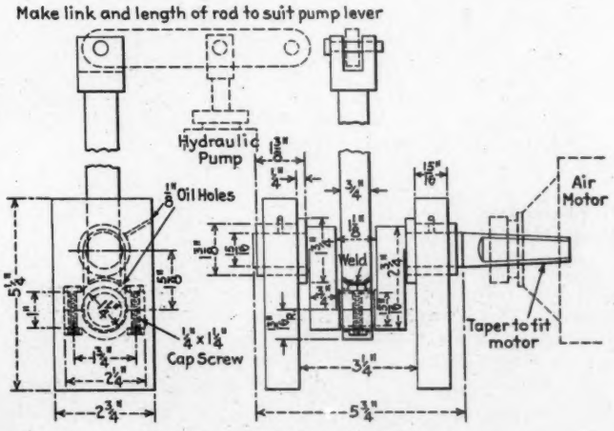
With this arrangement the lathe operator may set up a piece of work and start right in on the actual cutting operation. There is no necessity of checking the work with a piece of chalk together with the attendant starting and stopping of the lathe. In the shop with which the author is connected, 26 engine lathes have the chuck jaw screens calibrated in this manner.

Ring for Holding Chuck Jaws While Grinding

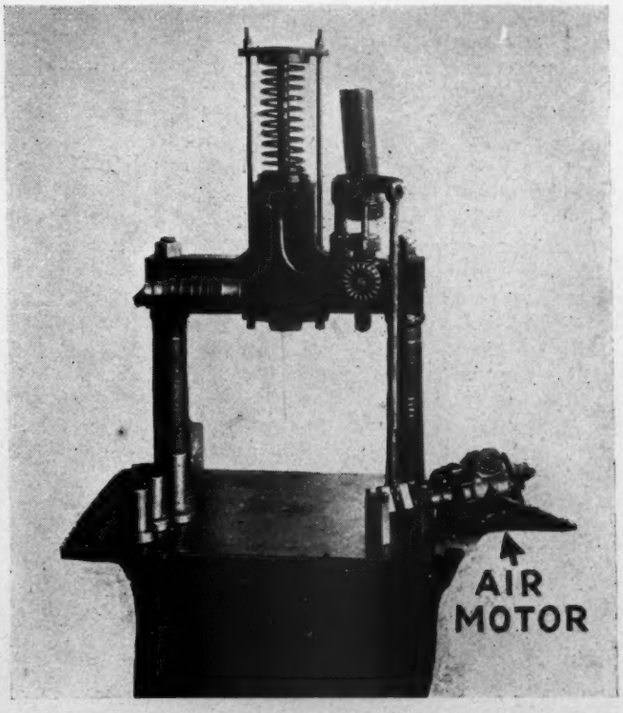
The accompanying drawing and photographs show a device for holding the jaws of a lathe chuck in proper position while grinding the inside face of the jaws. When chuck jaws become worn and require grinding it is customary, in this shop, to run them in on a notched ring such as the type shown in the illustration and, with a small portable grinder held in the lathe tool post, grind them out until they are cleaned up, after which they are removed from the chuck and the notches cut in on a grinder. The advantage of this grinding ring is that it holds the jaws in their proper position, with the pressure out, exactly as they are when they are clamped down on a piece of work.

Small Power Driven Hydraulic Press

The accompanying drawing and photograph show the details of a small bench-type hydraulic press, having a 3½-in. diameter cylinder, equipped with an air-motor drive. This press is one of several used in a large locomotive shop for work on locomotive valve gear bush-



Details of crank drive for pump arm



Air motor drive and crank shaft assembly on a small hydraulic press

ings. The drawing shows the details of the crank shaft, bearings and connecting rod which were designed for driving the plunger arm of the hydraulic pump. The connecting rod is a Model T Ford rod with a pipe extension and a jaw at the upper end for connection to the hydraulic pump arm. One end of the crank shaft has a taper shank to fit the air drill. The photograph shows the air-motor drive and crank shaft assembly on the press table. The crank shaft bearings, in this case, are small blocks secured to the table of the press with cap screws. On some presses of this type, in the shop where this device was developed, it was possible to connect the air motor and drive on the press cross arm where it is entirely out of the workman's way.

Questions and Answers On Welding Practices

(The material in this department is for the assistance of those who are interested in, or wish help on problems relating to welding practices as applied to locomotive and car maintenance. The department is open to any person who cares to submit problems for solution. All communications should bear the name and address of the writer, whose identity will not be disclosed when request is made to that effect.)

Reclaiming Metallic Hose Connections

Q.—We have a great many damaged metallic steam hose that have been taken out of service because the threaded ends are jammed. This threaded end is very short and difficult to machine but it seems that there must be some way to reclaim these hose by welding.

A.—The simplest and quickest method of reclaiming these connectors requires no machine work and little welding. The damaged threaded ends are removed with the cutting torch. When cutting leave at least ⅛ in. of the original boss. Either in the pipe machine or with the cutting torch cut the threaded end from a piece of pipe or nipple of the correct size to replace the threaded portion removed. Vee this new piece on the emery wheel and weld it securely with mild-steel rod to the body of the connector. The joint will be ready to serve equally as well as a new one.

Removing Broken Studs

Q.—Would you suggest some methods to be used in removing studs around a locomotive?

A.—The principal method in daily use in most shops is to remove broken studs with the cutting torch and, in most instances, this method is entirely satisfactory. Naturally no one not experienced at cutting out broken studs should attempt this operation. This is especially true on or around the locomotive boiler. Occasionally, on some parts cutting out the broken stud with the torch may not be permitted. In this case a new and novel method may be employed. A scrap nut slightly larger than the broken stud is placed over the protruding end of the broken stud. The nut is welded to the exposed end of the stud by arc welding. The hole in the nut need not be filled as long as there is a good bond between the nut and the stud. When the weld has cooled slightly a wrench may be applied to the nut and the contrary stud backed out of the hole. The heat that the stud received during the welding operation seems to loosen the most stubborn stud and it comes out leaving a good clean hole.

Welding Reservoir Lugs

Q.—Can the broken lugs on cast-iron air-brake reservoirs be welded or rebuilt without preheating?

A.—Broken or worn lugs on these reservoirs can be welded or rebuilt with bronze without preheating. When rebuilding the lugs with bronze, a carbon plate can be placed in position under the broken lug and the desired amount of bronze built into place. When welding the lug back in place with cast iron, the carbon plate must not be used as the carbon picked up from the plate will harden the deposit to a point where it will be impossible to drill bolt holes. A much softer and better job will be obtained by placing the part to be welded in an upright position and rebuilding layer upon layer until the desired height is reached. This may take a little longer but the more satisfactory results will be justified. Excess metal can be melted from the lug and ground to size with a portable grinder.

Finishing A Cast-Iron Weld

Q.—There are times when I need to rough finish a cast-iron welding job to save machine work, however, when I attempt to melt the weld down I undercut it and have to rebuild. Will you recommend a method to follow in avoiding this?

A.—Several years ago before bronze welding became so popular many welders were very clever at cast-iron welding. After the weld was completed the welder would grip a heavy coarse file in his right hand and, holding the welding torch in his left hand, he would heat the area to be smoothed to a flowing heat. As soon as the metal began to flow he would make two or three quick passes across the surface with the file. Each pass removed some of the cast iron. This process is carried out until the part is reduced in size to suit the operator and a good square corner produced. The metal that adheres to the file is removed by striking the file sharply against the bench. Square shoulders, round lugs and all kinds of shapes and parts may be built in this manner.

Gas Cutting "Drag"

Q.—In cutting with an oxyacetylene torch what is meant by the term "drag"?

A.—In flame cutting, the cutting oxygen jet usually enters the cut vertically to the surface, in line with the cutting oxygen orifice axis. After traversing about one-half the thickness of the cut it may curve backward in a direction opposite to the travel. When this occurs, the amount by which the oxygen jet falls behind the perpendicular in passing through the material is known as the "drag" of the cut. Faint markings or ridges called "drag lines" left on the face of the cut enable this to be measured. Drag may be increased by either increasing the cutting speed or reducing the cutting oxygen pressure. In fact, the drag can be made to increase until the cut no longer penetrates entirely through the material. However, if the drag is excessive, slag which is hard to remove will adhere firmly to the bottom of the cut. On the other hand, to reduce the drag below a certain limit, a sharp increase in cutting oxygen consumption is required.

Satisfactory gas cuts must have a drag sufficiently short for the purpose intended and to allow cutting the final corner and "dropping" the piece. The sides of the cut should be square and smooth, not grooved, fluted, or ragged. There should be no firmly adhering slag on the bottom of the cut, as this requires an appreciable expenditure of labor for its removal. With proper adjustments, only loose slag, or none at all, is obtained. Finally, the upper and lower edges of the cut should be sharp enough

to meet the requirements of the particular job. Straight line cuts usually can be made with considerable drag without much detrimental effect because the drag lines lie within the plane of the cut and do not prevent both top and bottom edges of the cut being left clean and sharp. This procedure saves oxygen. In shape cutting, when rounding curves or corners, less drag is permissible, as the bottom contour of the cut will tend to come out differently from the top with the edges not square. Such cuts must be made with small drag and are known as "high quality" cuts. Precision machine flame cuts are necessarily of high quality.

Riveting vs. Welding In Tank Repairs

Q.—We are repairing several 15,000 gal. tenders by renewing the side sheets 12 in. up from the bottom for a distance of 102 in. The tank is of riveted construction with the side sheet riveted to the flanged bottom with ⅝ in. rivets having a 2⅛-in. pitch. The side sheet is ¼ in. thick. In applying this patch would it be satisfactory from the standpoint of strength to weld the patch in place using a ¼-in. fillet weld along the bottom and a butt-weld along the sides and top of the patch?—M. E. F.

A.—It would be satisfactory to apply a welded patch as outlined in the question.

Safe allowable stresses for fillet welds in shear, using shielded arc electrodes, are:

Size of fillet weld, in.	Lb. per lineal in.
⅛	1,200
3/16	1,800
¼	2,400
5/16	3,000
⅜	3,600
½	4,800
⅝	6,000
¾	7,200

A ¼-in. fillet weld 2⅛ in. long would carry a load of

$$2{,}400 \times 2.125 = 5{,}100 \text{ lb.}$$

⅝-in. rivet, which requires an $1\frac{1}{16}$-in. rivet hole, has a shear value of 12,000 lb. per sq. in.

The area of an $1\frac{1}{16}$-in. diameter circle is .37122 sq. in.

$$.37122 \times 12{,}000 = 4{,}454 \text{ lb., the load value of a rivet.}$$

Thus, the ¼-in. fillet weld 2⅛ in. long would be stronger than a riveted construction.

The working strength of butt welds of 100 per cent penetration into the base metal is usually calculated by multiplying the net cross-sectional area through the throat of the weld by 15,600 lb. for tension, by 13,600 lb. for shear, and by 18,000 lb. for compression.

With 100 per cent penetration the throat of the weld for a ¼-in. plate will be ¼ in.

Using the lowest value for the weld, we have

$$.25 \times 2.125 \times 13{,}600 = 7{,}225 \text{ lb.}$$ — load carried by ¼-in. butt weld 2⅛-in. long.

Load carried by ⅝-in. rivet = 4,454 lb.

Thus, a ¼-in. butt weld 2⅛ in. long would be stronger than the original construction.

Shop Tool Wagon

The illustration shows a shop tool wagon, used at the Chesapeake & Ohio shops, Richmond, Va., which is adaptable, with some variations in design, to carrying many different kinds of tools required in locomotive maintenance work. In particular among the tools, are wrenches of various kinds required on the rod and crosshead job—special open-end wrenches, large box wrenches, socket wrenches, etc. The wagon provides a convenient means of transporting these tools to and from the locomotive; tends to prevent losing the tools and keeps them always in a particular place where they can be readily located; and also avoids the throwing of tools on the ground or shop floor, even temporarily, where they become a hazard.

The tool wagon consists of a welded steel body, made of relatively thin sheets so as to minimize the weight, and is carried on four truck wheels, one pair of which is designed to swivel under the movement of the handle. The body of the wagon is undercut to permit making sharp turns. The wagon sides are inclined and meet at the top in the form of an inverted V. On the sides are welded the light steel straps which serve to hold individual wrenches and tools. The front of the wagon carries a hook and length of air hose which may be used for the operation of pneumatic tools or grease guns as required.

Tool wagon used at the C. & O. locomotive shops, Richmond, Va.

Southern Pacific Car Work

A NOTABLE record of achievement has been made in recent months on the Southern Pacific by the prompt servicing and efficient handling of an unprecedented number of passenger and freight trains, first consideration being given in all instances to those trains used to move troops and war materials. Facilities have been studied and equipment installed to expedite car handling in yards, at division points and in general repair shops such as those as Sacramento, Calif., where the labor-saving devices illustrated in this article have been largely developed.

Fig. 1—Typical lubrication wagon used on the Southern Pacific

In connection with lubrication of rolling stock, the Southern Pacific has found that equipment which is easily portable is the best insurance for a thorough and rapid lubrication service. Lubrication wagons, shown in Fig. 1, are an example. They accommodate all necessary items, including covered cans containing saturated waste and oil, journal jacks, jacking blocks, extra brasses, etc. Fig. 4 shows an oil lubricator wagon used for filling journal boxes and mechanical lubricators. It consists of a certified tank accommodating from 15 to 20 gal. of oil and is charged with air from a hand pump mounted on the wagon, saving much time and labor and eliminating the use of cans and hand-operated oil guns. These lubrication wagons keep oil clean and free from foreign matter, and speed up servicing of cars and locomotives.

Similarly brake-shoe wagons of the type shown in Fig. 2 have been built to hold 50 brake shoes, and as new ones are applied to cars old ones are removed and conveyed to scrap bins. Portable lamp wagons are used for picking up and distributing inspectors' and carmen's lamps, saving considerable expense and labor and eliminating the damage frequently done to lamps when handled in trucks. One of these lamp wagons is illustrated in Fig. 3.

Fig. 5 shows a portable propane tank wagon and scale

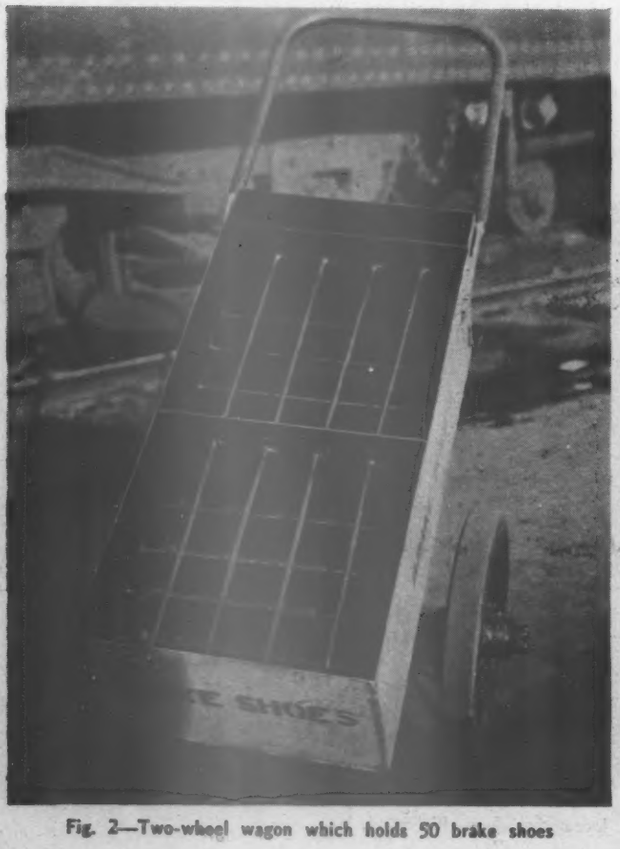


Fig. 2—Two-wheel wagon which holds 50 brake shoes

Fig. 3—A lamp wagon which saves labor and lamp breakage

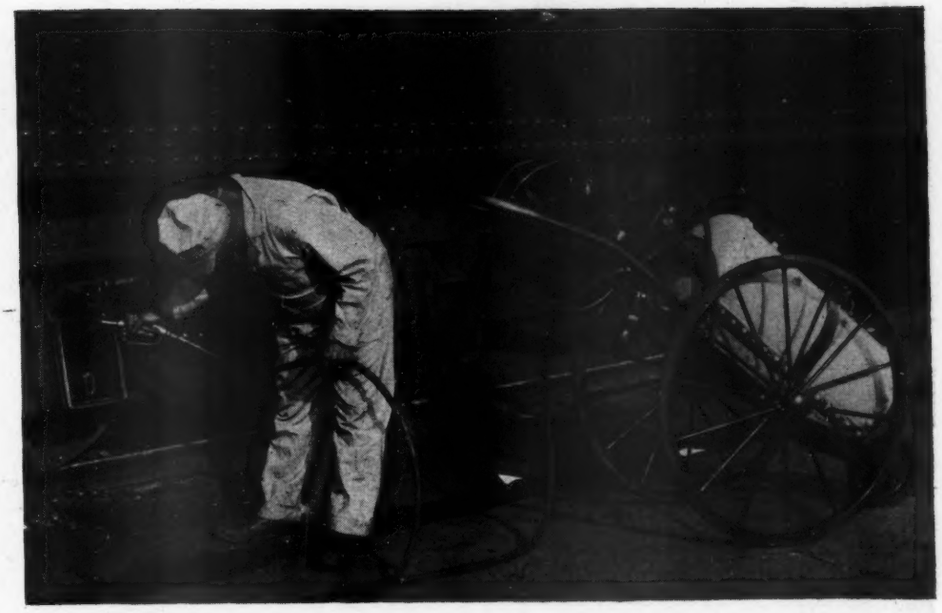


Fig. 4—Air-operated oil wagon used in lubricating car journals

used in servicing Waukesha air-conditioning units. Tanks are weighed empty and full on scales, built into the upper frame of the wagon, and conveyed from the supply depot to cars, and vice versa. This saves considerable time and expense and enables the railroad to keep an accurate record of the amount of propane gas consumed.

Portable air boosters, one of which is shown in Fig. 6, gives good results, taking air from yard lines and boosting it to standard pressure for testing high-speed brakes on individual cars or entire trains. They eliminate the necessity of installing stationary air compressors and can be moved from track to track. They consist primarily of a 9½-in. Westinghouse air pump, certified main reservoir, brake valve and gages, etc., mounted on four-wheel truck.

Fig. 8 shows a portable ice unloader used to handle 300-lb. cakes of ice at any location, which saves considerable labor in that it eliminates the necessity of ordering crews and spotting refrigerator cars at certain designated places, reduces the loss by melting, and prevents cakes from being broken up. The unloader can be lowered or raised to any height and is securely locked by side wings and clamps. Wagons used in conjunction with the unloader are built to carry eight 300-lb. cakes. Thus, much time is saved in supplying ice to air-conditioned cars. The illustration shows the counterbalanced, pivoted end of this unloader supporting a cake of ice and just ready to swing downward and drop the ice into a vertical position on a level with the ice wagon by releasing air pressure in the long 3-in. air cylinder.

In the reclamation plant, many items are being repaired and returned to service that were not previously attempted. For instance, broken pipe wrenches and monkey wrenches are being sent in; parts are removed from badly damaged ones to use on the others; teeth are resharpened and welding done where possible. Repaired wrenches are returned to store stock, thus minimizing the need for new wrenches.

Worn files are returned to this department and are

Fig. 5—A propane tank wagon equipped with scales for weighing tanks before and after being filled with gas

Fig. 6—Compact and convenient air booster used in testing high-speed brake equipment

Fig. 7—Steps in the repair and reclamation of a clasp brake beam —(A) Tested at 42,000 lb.; (B) Veed for welding; (C) Welded; (D) Finished

items are now being fabricated and welded, or cast in iron or steel.

Paints have been developed to replace aluminum and gold bronzes which have been satisfactory to date. Floor shellacs are now out of the question for railroad work and the railroad is testing out a shop-made substitute which has the quick drying features necessary for terminal repairs. Lacquers for pattern shop and molding are replacing shellac. The Southern Pacific has experimented with asphaltum as a substitute for the lead foil used when etching opal glass for drum-head signs, etc., on limited trains. Stencils for freight cars are now being made from U.S.S. No. 27 gage stove-pipe iron cut with nitric acid, instead of using zinc.

Furniture steel has been used in place of aluminum in modernizing passenger cars for such items as window capping, light extruders and various items of trimming. The steel is first cleaned, buffed and lacquered, and while not as workable as aluminum, it serves as a substitute.

Fig. 8—Portable ice unloader ready to tip a cake of ice down to the wagon floor level

reconditioned by heating in water then dipping in a 50-50 concentrated solution of sulphuric and nitric acids. Several dippings may be required depending on the condition of the file. Files are tested for sharpness and returned to store stock.

Train and signal hoses are brought in, cleaned, carefully examined, and tested, thus saving many hose that would have been scrapped ordinarily. Defective hose when possible are cut and spliced, in accordance with the method approved by the A.A.R. Similarly, pipe fittings, and A.A.R. valves, of which a large percentage formerly were scrapped when removed, are now being collected, cleaned, reconditioned and then returned to store stock.

In passenger car work nickel plating has been discontinued except for such items as signal equipment parts which are plated as a protection against corrosion. Silver plating, with satin finish, is applied on certain parts of "de luxe" passenger train cars where the use of paint is impractical.

For a number of years there has been difficulty in obtaining malleable-iron castings and in many instances the part could be cast in brass at about the same cost. This developed into the use of brass for items which would have been entirely satisfactory in malleable iron. These

Fig. 9—Radiagraph cutting machine used for trimming side-sill plates to size

Fig. 10—Portable end straighteners used on gondola and box-car ends

The modernizing of passenger-carrying equipment has resulted in a considerable accumulation of old crimson and green plush. The best of it is used for repairs to other equipment, and the balance is being used in place of the restricted burlap for upholstery work, for protecting parts of machinery when shipping or storing, and similar uses.

Large parts of car equipment formerly made in cast steel are being fabricated and welded to make a better and more serviceable part. Body bolsters, side bearings, truck pedestals, center-bearing arches, center plates and similar parts are included. One item of repairs representing a considerable saving has been the simple clasp-brake beam which is being reclaimed from scrap by welding on new ends and machining them to size and contour. An illustration of this is given in Fig. 7.

A portable car-end straightener, two of which are shown in Fig. 10, is used to great advantage for repairing freight cars. It consists of a steel pole suspended on a frame about its center with the lower end pivoted from the frame. The center is raised and lowered to the desired position by a cable over the pulley shown, and connected to a spool with a ratchet and pawl, operated by hand. A lift jack is placed under the lower end of the pole and the pole pivot is connected to the car truck axle with a chain. The car end is heated where necessary and, as the jack is raised, the top end of the pole forces the car end into proper alinement.

In connection with the present program of new Southern Pacific 70-ton flat-car construction, the road has developed production jigs and fixtures which are of special interest.

Fig. 11 shows a punch press for punching rivet holes in center- and side-sill plates. The plate is guided

Fig. 11—Press for punching rivet holes in center- and side-sill plates

through the press by weighted cars on rails fastened to each end. The helper at the left moves the car through equal intervals by the use of stops, an amount equal to the lengthwise rivet pitch. The punch operator, by use of a dial indicator, operates the sliding head of the press to make the required crosswise spacing and to punch the required size of hole. Each time the helper moves back one interval, the operator moves the dial one position which indicates the required punching for that interval. Thus, after passing through the press, all necessary rivet holes have been punched and the plate is ready for trimming and fitting up.

The plates are next trimmed to size using a radiagraph cutting machine shown in Fig. 9. Fig. 12 shows a set-up for bending the center- and side-sill angles.

Fig. 12—Jig for bending center and side-sill angles

Here the angles, having been punched, are bent to a template. The angle templates are used on the last car.

Jigs for fitting up and riveting center and side sills consist of posts mounted in concrete foundations. Each post is mounted with a pivot and lock arrangement to which the sills are fastened. Thus, the sills are supported in a horizontal position for fitting up and reaming, then swung into an inclined position, shown in Fig. 13, for riveting.

Fig. 13—Car sills are swung into an inclined position for greater convenience in riveting

Instructions for Servicing AB Self-Oiler Pistons

The A. A. R., Mechanical Division, Committee on Brakes and Brake Committee has recently prepared the following complete instructions for servicing the self-oiler type of pistons used in AB freight brake equipment:

The piston, slide valve, graduating valve and bushings must be thoroughly cleaned so as to remove all dirt, oil, gum or grease. Benzene, gasoline or other approved cleaning fluids can be used for this purpose.

The piston packing ring and its groove should be cleaned without removing the ring from the piston groove. This can be done by dipping the piston into cleaning fluid and then moving the ring around in the groove (for an early vintage of self-oiling piston which has two drilled holes in the piston head near the top of the piston, see Appendix A). This operation should be repeated until the groove and ring are thoroughly cleaned, after which the excess cleaning fluid can be blown away or dried by using an air jet.

Where rings are stuck with dirt too tightly to be moved in the groove it may be necessary to soak the ring in penetrating oil and then tap the ring gently with a hard wood block. For this purpose a maple or hickory wooden block about 1 in. by 1 in. by 4 in. (with square ends) should be used to tap the ring so as to drive it flush with the top edge of the groove. This tapping should start at one side of the ring joint and progress around the piston in short steps until the ring is loosened sufficiently to be moved in the groove. If this procedure will not loosen the ring it is evidence that the groove is binding, in which case the groove must be reconditioned and a new ring fitted.

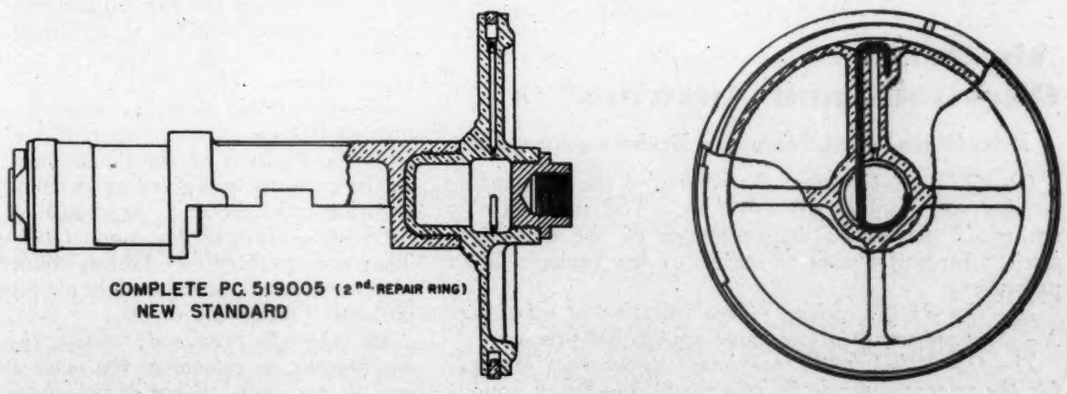
If the wick which runs from the small crescent shaped recess in the bottom of the ring groove to the oil reservoir wound in a counter-clockwise direction around the oil reservoir. The free end of the wick should not obstruct or come in contact with the $\frac{1}{32}$ in. diameter breather hole located adjacent to the wick hole in the oil reservoir.

When the packing ring and its groove are thoroughly cleaned and dried the end of the ring should be positioned above the lubricating hole in the bottom of the ring groove at the top of the self-oiling piston. Raise the end of the ring and see that the lubricating wick is flat on the bottom of the recessed portion of the ring groove. The wick should touch neither the ring nor the mouth of the breather hole.

The threaded cap nut which seals the oil reservoir in the self-oiling piston head must be removed to refill the oil reservoir. Before removing, insert a cap screw or its equivalent into the outer tapped opening so it will not be distorted by the wrench when being removed. The stem back of the piston head is drilled for a spanner wrench to facilitate holding the piston.

Hold the piston head in a horizontal position with the stem down and note that the wick leading from the ring groove winds in a counter-clockwise direction around the wall of the oil reservoir. The free end of the wick should not obstruct or come in contact with the $\frac{1}{32}$-in. breather hole located adjacent to the wick hole in the oil reservoir. Fill the oil reservoir with an approved triple valve oil until the oil is level with the bottom of the threads located in the center of the piston head. Start the cap nut a few threads and then hold the piston head in a vertical position. The stem back of the piston head should be held firmly with a spanner wrench and the cap nut, with cap screw still in place, pulled tight. Remove the cap screw from cap nut.

The face of the graduating valve, the upper surface of the slide valve (which is the graduating valve seat), the slide valve face, the slide valve seat and the upper portion of the bushing (slide valve spring bearing) must be



Self-oiling feature used in both the service and emergency pistons of AB freight brake valves

in self-oiling type pistons is damaged from any cause, such as reconditioning the groove, etc., it must be replaced. A new wick is approximately 5¾ in. long and to facilitate assembly a special wick is available having bare wire on one end for about 2¼ in. If specially prepared wicks are not available the wire may be bared by burning. The bare wire can be easily started down through the wick hole and the wick pulled through the hole, until about ½ in. end is left in the ring groove. The end of the wick in the ring groove is then bent across the middle of breather hole and anchored in the last hole in the recessed section at the bottom of the ring groove. The bare wire should then be cut off the wick and the wick glazed with the best grade of very fine pure dry air brake graphite.

To apply the graphite, it will be found convenient to use a small wooden paddle about 8 in. long having a small piece of chamois skin glued to the paddle end. The width of this paddle must be somewhat less than the width of the slide valve seat in the bushing. Place a small quantity of the graphite on the chamois skin and rub the surfaces specified until they show a dark copper color. There must be no free graphite allowed to remain on the valves or seats and they must be free from any oil or grease before the graphite is applied.

Before the cleaned piston is replaced in the piston

bushing the side of the packing ring opposite the scarf should be pressed to the bottom of its groove and three drops of approved triple valve oil put in the groove through the ring scarf opening. Then restore the ring to its normal position and carefully rotate it in the groove to distribute the oil. Position the ring scarf at approximately one o'clock when facing the piston head. Next, place three drops of the triple valve oil in the clean, dry bushing and distribute it over the entire surface in a manner to avoid introducing dirt or grit. Then insert the piston and slide valve in the body, leaving them in release position, after which place three additional drops of triple valve oil in the cylinder bushing and again distribute it on the bushing surface as previously described.

Appendix A

An early vintage of self-oiling piston, having two holes drilled in the piston bead near the top of the piston, must not be submerged in cleaning fluid. To clean the packing ring and its groove squirt the cleaning fluid around the ring and then move the ring around in its groove, this operation being repeated until the groove and ring are thoroughly cleaned, after which the excess cleaning fluid can be blown away or dried, using an air jet.

If for any reason it is necessary to remove the ring from the piston, the wick in the bottom of the ring groove should be removed and it need not be replaced when a new ring is applied.

The same procedure for filling the oil reservoir should be followed for other types of self-oiling pistons. This type of piston does not have a spanner wrench hole in the stem back of the piston head so that when removing or applying the oil reservoir cup nut it will be necessary to hold the piston by the squared portion of the stem adjacent to the piston head. It will be noticed that the oil reservoir is packed with gauze. Be sure that the gauze pack is thoroughly saturated and that the oil level does not recede from the bottom of the threads.

Air Brake Questions and Answers

HSC High-Speed Passenger Brake Equipment

69—*Q.—What insures the return of the self-lapping portion to release position?* A.—The relay portion spring *42* overcomes the resistance of the diaphragm stack, affording a positive release of low brake cylinder pressures.

70—*Q.—Is this release force effective at all times?* A.—No; only with a low valve application pressure.

71—*Q.—What is the maximum application pressure for the release force to be effective?* A.—Seven pounds above this amount the release force is nullified.

72—*Q.—Why was this limit decided upon?* A.—In order to provide a true ratio of brake cylinder pressure to straight-air pipe pressure for all applications above this value.

73—*Q.—How is this done?* A.—This is done by the inshot valve which, at the start of an application permits *direct flow to all diaphragm chambers* until 7 lb. is obtained.

74—*Q.—What does the 7 lb. pressure accomplish?* A.—It overcomes the resistance of the release spring and operates the relay portion to provide a low brake cylinder pressure, sufficient to overcome brake rigging resistance and apply the shoes to the wheels.

75—*Q.—What happens then?* A.—The inshot valve port cuts off the direct flow of air to all diaphragm chambers except that of the controlling diaphragm.

76—*Q.—What does the inshot valve portion consist of? (See Section A-A, Fig. 5)* A.—A diaphragm *85*, supported between the body and bracket castings, to which is assembled a piston *84*, a supply valve *92* with its spring *94*, exhaust valve *93*, with its spring *94*.

77—*Q.—What is the normal position of the piston?* A.—The spring normally holds the piston and diaphragm against the stem of the supply valve which is held unseated against the tension of its spring.

78—*Q.—What flow of air results?* A.—Permits flow of air to the diaphragm stack.

79—*Q.—When is this flow of air cut off?* A.—A 7-lb. pressure compresses the spring, deflecting the diaphragm sufficiently to permit the spring to seat the supply valve, cutting off communication to the diaphragm stack.

80—*Q.—What is the normal position of the exhaust valve?* A.—It is normally seated by its spring.

81—*Q.—When is the exhaust valve unseated?* A.—When inshot pressure exceeds 7 lb., the diaphragm *85* will be deflected further, moving the piston *84* to engage the stem and unseat the exhaust valve.

82—*Q.—What results from this movement?* A.—This movement opens a passage way for the exhaust of the air between the diaphragms of the stack to the strainer protected exhaust *82*. If the relay valve is furnished with magnets the exhaust air will flow through the magnet check valves before reaching the strainer.

83—*Q.—When does the diaphragm return to its cut-off position (retaining 7 lb. inshot pressure)?* A.—After excess pressure is removed.

84—*Q.—What protects the valve from dirt, etc.?* A.—A strainer *17* (See Section C-C, Fig. 5) in the pipe bracket, protects the valves as air from the displacement reservoir or straight-air pipe passes through it.

85—*Q.—What does the magnet bracket include?* A. Three magnets; high speed (H. S.), medium speed (M. S.) and low speed (L. S.).

86—*Q.—How are the magnets wired?* A.—The coil of each magnet is wired to terminal blocks *123* and *145* (Fig. 5) with plug connections to the speed governor relay cabinet. (Fig. 16.)

87—*Q.—What does the magnet control?* A.—Each magnet has an armature stem *154* (Fig. 5) which controls the position of the double-beat magnet valve *161* as the coils are energized or de-energized in accordance with the train speed.

88—*Q.—How do the magnet valves function?* A.—They are operated to establish connection from the displacement reservoir or straight air pipe to one of the diaphragms (*38, 68, 64* or *60*).

89—*Q.—As previously stated, the area of the three diaphragms, as related to the main diaphragm, is 80, 60 and 40 per cent. What is the object of this variation?* A.—Each diaphragm is in control at certain train speeds.

90—*Q.—At what speed is the main diaphragm in control and what results from this control?* A.—This diaphragm is in control at speeds exceeding approximately 65 m. p. h. and the self lapping portion reproduces brake cylinder pressure equivalent to straight air pipe pressure.

91—*Q.—When is the 80 per cent diaphragm in control.* A.—Between speeds of approximately 65 and 40 m. p. h.

92—*Q.—What results from control by this diaphragm?* A.—Only 80 per cent of the straight air pipe or displacement reservoir pressure is reproduced in the brake cylinder.

93—*Q.—At what speed is the 60 per cent diaphragm*

in control? A.—Approximately between 40 and 20 m. p. h.

94—*Q.—At what speed is the 40 per cent diaphragm in control?* A.—At speeds below 20 m. p. h.

95—*Q.—Are the results similar to the 80 per cent diaphragm when the 60 and 40 per cent diaphragms are in control?* A.—Yes, the percentage of straight air pipe or displacement reservoir pressure reproduced in the brake cylinder coincides with the particular diaphragm in control.

96—*Q.—What serves to conserve battery current when the brakes are released?* A.—A K-3 switch portion (Fig. 11).

97—*Q.—Where is it applied?* A.—To the pipe bracket of the FS 1864 relay valve and wired in the battery circuit to the magnet valves.

Better Fits for Brake Shoes

According to a circular letter recently issued to the members of the A.A.R., Mechanical Division, the committee on Brakes and Brake Equipment reports that an inspection of over 34,000 brake beams disclosed approximately 50 per cent of all removals due to worn heads. The worn head condition is a direct result of relative motion between the brake shoe and the brake head, the better the fit between these two parts being, the less they move with respect to each other and consequently minimize wear.

The Mechanical Division manual on Standard and Recommended Factors shows the dimensions of standard gages used in gaging brake heads and brake shoes, and in order to conserve material as much as possible and extend the life of brake beams, the committee recommends that sufficient heads and shoes be gaged as received from the source of supply to insure that they meet the limits imposed by the gages.

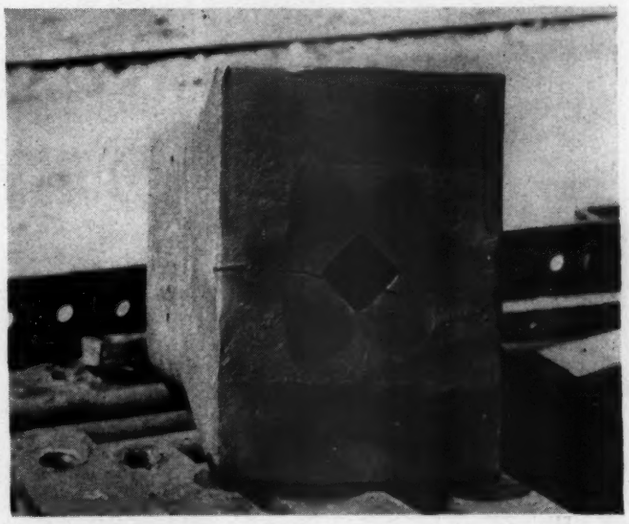
More Draft Gear Bearing Area Needed

By W. C. Fox

The A. A. R. Committee on Couplers and Draft Gears at the 1937 meeting recommended that the draft gear bearing area be increased 67.5 per cent on the vertical cast steel yoke, Grade B steel. It was also proposed to reduce the wedging effect of the bearing area by decreasing the taper of the contact surface. The report mentioned above (Circular No. D. V.-917), was signed by seven of the leading railroad men in the mechanical field, but I do not believe it was accepted. It was pointed out that the increased bearing area would strengthen the yoke and would not sacrifice any desirable feature.

Just recently I had occasion to inspect a yoke which was removed from a car. The yoke was practically new, having a casting date of 12-41, and I noticed that it had a draft gear bearing area of about 23 sq. in. and had the ⅛-in. taper which the committee decided was too sharp. If the change in design had been made, the yoke would have had a bearing area of 38.75 sq. in. The illustration shows a gear barrel which is split across the base and up both sides. If the gear casing is not broken, a depression is formed in the base by the pulling surface of the yoke which shortens the gear and causes unnecessary slack.

When a new gear is applied with a yoke of this kind, it will be noticed that the pulling surface of the yoke on the gear is only about 5 sq. in. and, as the slack is taken up on a train of cars, the yoke hits the gear base directly in the center where it is the weakest on a number of our standard makes, and the constant hammering soon shatters the metal. If the proposed change in the design of the coupler yoke had been made at that time, and it could have been made very easily, I believe it would have saved the car owners thousands of dollars.



Draft gear barrel split across the base and up both sides owing to limited bearing area

Why Have So Much Space Between Shoulders of Rear Draft Lugs and Coupler Yoke?

If a train of freight cars were pulled on the highway where there were no rails to guide them it would be found that some of the cars would run to one side of the road and some to the other side. This would increase the draft of the train and is caused by cars not being pulled from the center. Shoulders on rear draft lugs are so far apart that the vertical coupler yoke can be as much as 14 per cent off center on the draft gear. It is natural for the yoke to slip to the weaker side of the gear and to stay there. When gears are removed it is often found that one side of the gear is badly worn and that the other side is hardly worn at all.

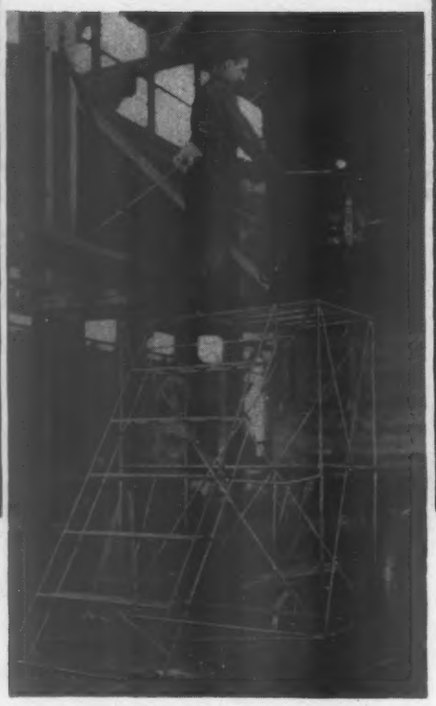
This habit or tendency of the yoke to slip to one side of the gear and to pull from there is as prevalent with the newer type swivel butt coupler and corresponding yoke as it is with the older, more rigid yoke and coupler. This side slipping of the rear end of the yoke on the gear is increased on the older type of vertical yoke by the fact that it is almost impossible to find a yoke on which the front key slot wearing surfaces are square with the body of the yoke on account of uneven wear or unequal shimming.

A car that is not pulled from the center will cause unnecessary wear on the wheel flanges and rails and will not roll as easily as one pulled directly from the center. Cars with cushion underframes and cars with Farlow yoke attachments naturally would not be classed with cars mentioned above.

A side-door hanging device —The door is loaded in the cradle which is then elevated by the gear winch

A portable air - operated electric floodlight unit for use where ordinary electric lights are not available—It is especially useful for emergency night repairs on the rip track—Adjustable floodlight standards also are availab'e for use on interior car work

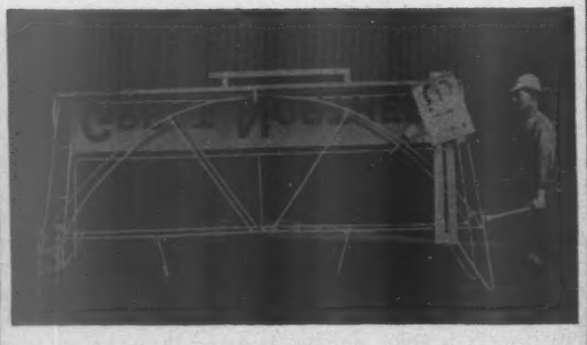
A light, portable platform, built of welded tubular steel, convenient for working on the ends of box cars



A portable adjustable staging for working on the sides or ends of cars—Its height can be adjusted by means of the hand winch — Vertical movement of the platform is guided by the telescoping standards at the four corners

Tubular construction, as in many other portable platforms and stagings, is also used in this light, rigid hand ladder

Great Northern Car Shop Devices



A light, strong, easily portable staging for car stenciling, made of welded pipe, with two wheels under one end and legs and drop handles at the other end—Hoops and brackets hold a complete outfit of stencils, stencils guns, hose, etc.

(*Turn to next left-hand page*)

NO
Critically Strategic Metals are Needed TO MAKE CHILLED CAR WHEELS

No stock piles are called on for scarce metals to help make Chilled Wheels.

Only iron is required and much of that is used over and over as the Wheels retired from service are returned to our foundries under the unique exchange plan.

Where a shortage of used wheels exists, the industry is dependent upon pig iron, but under the officially approved plan of the W.P.B., manufacturers are able to continue to make the vitally necessary wheels for railroad service.

Chilled Car Wheels not only save money, but today they save priceless metals for use where they are indispensable in winning the war.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

230 PARK AVENUE, NEW YORK, N. Y.

445 N. SACRAMENTO BLVD., CHICAGO, ILL.

AMCCW

ORGANIZED TO ACHIEVE:
Uniform Specifications
Uniform Inspection
Uniform Product

High Spots in
Railway Affairs . . .

Railroads Highly Complimented

From the time the United States entered the war until the end of July the railroads carried in organized movements about six and a quarter million troops. In commenting on this Brigadier General Charles P. Gross, chief of the Transportation Corps of the Army's Service of Supply said: "In the war effort, no group, no agency, works more wholeheartedly, more energetically to fulfill the war mission than do the railroads and their national organization, the Association of American Railroads. Their team play has been superb. They respond to the War Department immediately and to their full capacity. My relationship with them has been one of the most heartening experiences I have had. The railroads have the spirit that will win the war."

Pensioners Called Back

The Employment Service of the Railroad Retirement Board, at the request of former railroad workers desirous of assisting in the war-time emergency, is undertaking to return annuitants and pensioners to railroad service. If these men are physically fit and want to return to service, the Board will try to place them, or in case railway employment cannot be found, will refer them to the United States Employment Service for possible placement in other critical industries. The Railroad Retirement Act of 1937 will prevent those receiving annuities to do so in any one month they work for a railroad. An effort will therefore be made to so arrange the beginning and ending dates of resumed service so that they will not receive less in any one month than if they had remained on the annuity roll for that month. Pensioners — those who were transferred from private railroad pension rolls to the pension rolls of the Railroad Retirement Board—will continue to receive their pensions while they are employed.

Ayres on Railroad Freight Capacity

Brigadier General Leonard P. Ayres, who recently retired as chief of the statistical branch of the U. S. Army, is vice-president of the Cleveland Trust Company and is widely known as a sound economist. He points out in an article in the Business Bulletin of the Cleveland Trust Company that: "Our railroads are doing an outstandingly good job of war-time transportation. Probably they can just about succeed in carrying the peak volumes of autumn freight in September and October without any serious car shortages. Nevertheless it ought not to be assumed that they can indefinitely continue to transport volumes of freight that increase steadily and unceasingly from month to month. The limits of their capacity have been nearly reached, and when they are reached the volume of our industrial output will have to level off no matter what other forms of transportation may be called into service, and no matter how large the war appropriations may be." Included in General Ayres' article is a graph that presents the statistical background for this warning statement. Using the average figures for the year 1939 as a base, represented as 100 on a comparative scale, the diagram shows that the number of ton-miles of freight carried by the railroads each month since then has grown steadily—making due allowance for seasonal variations and such exceptional conditions as strikes affecting coal shipments—until in the middle of this year it reached a point about 175 on the scale without showing any tendency to level off. In the same period the number of freight cars on the railroads has remained relatively uniform, increasing from the base value of 100 only to approximately 105, while the number of locomotives has decreased from the base point of 100 to less than 95.

Eastman on the Material Situation

In discussing the railway material situation in an article in the Railway Age, Director Joseph B. Eastman of ODT, made this significant statement: "It is my conviction, therefore, that for the successful prosecution of the war, in which transportation plays so great a part, it is essential, first, that the railroads be provided with an adequate supply of the materials necessary to keep present equipment and facilities in good running order, continually and without interruption, and second, that they be provided, not with an abundance, but with a moderate and modest supply of new locomotives and cars. True, the steel which will go into the railroad industry under such a program cannot then be used for armaments, but it is essential, not only to the production but to the use of the armaments, that there be no break-down or let-up in the constant and efficient functioning of transportation. Nor will such a program render unnecessary in any degree unremitting attention to the maximum utilization of the transportation facilities that we have. The thing which gives me the greatest satisfaction is that I am confident that the railroad industry has full realization of this need and is bound that it will at all costs do its part in winning the war. The spirit and morale of the industry have never been better."

Railroads Need New Equipment

General Charles P. Gross, chief of the Transportation Corps of the Army's Service of Supply, recently participated in a radio round-table discussion in Washington. He pointed out that if the steel required for the war is to be obtained the railroads must be allowed the equipment necessary to move the things that produce this critical material. "The railroads need steel," General Gross said. "Every war agency seems to require more than it is getting. But in order to make one ton of steel, the railroads must haul five tons of ore, coal, coke, limestone and the other essentials for its manufacture. To get the steel, the railroads must be able to play their essential part. They must be geared to the full, all-out war effort of this nation as a vital element of the team. The railroads have met the startling increases in traffic since 1939 largely by using their reserves rather than by additions to their equipment. They have used existing equipment more intensively with increasing cooperation between companies. They have reduced their unserviceable units and brought them into use. They have loaded cars more completely. This reserve capacity in heavier loading, in blocking through solid trains and in unification of effort is not exhausted, but there is far less fat left. The additional loads that are coming in 1943 must, therefore, be met to a greater degree by new equipment."

Grade Crossing Accidents

A tremendous effort is being put forth by the National Safety Council to reduce accidents because of the serious effect they have on slowing down our war efforts. The railroads have contributed generously to the funds being raised to promote this campaign. One phase of the problem which seriously effects their efficiency and effectiveness is grade crossing accidents. The railroads have consistently done what they could to eliminate such accidents, but the public generally and public authorities have not cooperated to the extent that they should. President Jeffers of the Union Pacific has appealed to the governors of states served by his railroad to take action. As a result several of them have issued proclamations calling upon motorists to stop vehicles before crossing railroad tracks. These proclamations point out that accidents at crossings have caused serious delays and damage to vitally needed war equipment and have endangered the lives of persons and troops being carried. In too many instances the drivers fail to observe warnings and crash into the sides of trains.

(Turn to next left-hand page)

A MILLION TONS OF FREIGHT ARE MOVED A MILE

. . . each minute of the day and night!

That's one measure of the railroads' present contribution to the national war effort—a fighting force of the first importance.

In the words of Mr. John J. Pelley, President, Association of American Railroads, "The railroad freight car is truly a weapon of war because it is the freight car, together with the locomotive which pulls it and the track on which it runs, that make possible all the other instruments of war. Without them, the whole war effort would collapse."

Lima-built Modern Super Steam Power Locomotives are serving the railroads from coast to coast in their gigantic task, helping them to make and to break all records in gross-ton-miles per train-hour.

LIMA LOCOMOTIVE WORKS LIMA LOCOMOTIVE WORKS INCORPORATED **INCORPORATED, LIMA, OHIO**

NEWS

Industrial Freight Cars Placed Under Limitation Order

GENERAL Limitation Order L-97-b, taking control of the production and delivery of industrial cars was issued on August 8 by the War Production Board. Industrial cars are defined as "cars of the railroad type (including cane cars) which are used in intra-plant service."

Railroad Shops Contribute to War Production

SEVERAL roads are now cooperating in the nation-wide program for using railroad shops for war production to which they are adapted. Among these are the following:

Baltimore & Ohio.—Repair shops on July 15 began producing crosshead guides and guide plates from rough iron castings for the vertical triple-expansion marine engines used in the Liberty cargo ships under construction in Baltimore shipyards. This work, sandwiched between regular railroad repair and production jobs, is done by the employees under their regular wage-and-hour agreements with the railroad, and the company's sub-contract is on a non-profit basis. B. & O. shops also have undertaken repair work on locomotives, cranes, and other equipment owned by industries engaged in war work.

New York Central System.—The New York Central System has received an initial order for a special type of marine equipment to be produced in its own shops. For some time past the railroad has been exploring its shop capacity to develop the extent to which it might be employed in aiding the production of armaments. As a result, negotiations are now under way contemplating the manufacture of a wide variety of articles required in the war program—forging gun barrels, anchor shanks and shackles; the machining of parts for combat tanks; the manufacture of forgings for marine engines; and spot welding aluminum plates.

"Two of the Central's shops in the midwest," said F. E. Williamson, president, "have been turned over completely to the War Department. One of these is now being used for training men of one of the Engineer Railway Shop Battalions recently called into service, which includes among its officer personnel some of the Central's best shop experts.

"The second shop in the midwest has become an important depot for combat tanks. Through this shop large numbers of tanks, manufactured at various plants within the surrounding area, are channeled for final check just before they are sent on their way into service. A third shop in the East has been made available for the manufacture of reciprocating steam engines for Liberty cargo ships for the Maritime Commission."

Pennsylvania.—War production activities in Pennsylvania shops began about the middle of May, and have already reached large proportions. Work now going on includes machining ordnance parts; casting cylinders for 2,500-hp. triple-expansion marine engines for the merchant fleet; machining rolling mill rolls to be used in the production of ammunition cases; and machining frames for the trimming presses used in war industries to shear off the "flashings," or rough projecting edges, from drop forgings.

Other jobs in prospect for this road's shops include machining tank parts; machining and finishing air compressor cylinders for submarines; and building "hot metal" cars for steel mills, used chiefly in carrying hot slag to dumps, but also employed in transporting molten metal from one place to another in steel plants.

Readjustments Have Released 114 Locomotives, 533 Passenger Cars

VOLUNTARY revisions in passenger schedules, services and equipment assignments during the first six months of 1942 by the principal passenger-carrying railroads have resulted in the release of 114 locomotives and 533 passenger-train cars for the needs of war traffic, according to the Office of Defense Transportation. A daily saving during the six months period of 24,700 passenger train-miles, and 176,000 passenger car-miles as the result of the revisions also was announced.

1941 Freight Commodity Statistics

TONS of revenue freight originated by Class I railroads in 1941 showed an increase of 21.6 per cent over 1941, according to the Freight Commodity Statistics issued by the Interstate Commerce Commission's Bureau of Statistics. Last year's total was 1,227,675,897 tons as compared with 1,009,420,663 tons in 1939.

The 1941 totals by commodity groups and the percentage increases over 1940 are as follows: Products of agriculture, 100,172,666 tons, 12.8 per cent; animals and products, 16,810,149 tons, 8.8 per cent; products of mines, 684,433,639 tons, 20 per cent; products of forests, 71,536,304 tons, 22.9 per cent; manufactures and miscellaneous, 336,623,134 tons, 28.5 per cent; all l. c. l. freight, 18,091,005 tons, 23.1 per cent.

The statement also sets forth freight revenue by commodities; and there again all groups showed increases over 1940, the range being from the 8.5 per cent rise in the revenue from animals and products to 36 per cent for manufactures and miscellaneous. The total 1941 freight revenues are shown in the statement as $4,624,819,565, up 25.7 per cent from 1940's $3,678,097,359.

American Welding Society to Hold Convention in Cleveland

THE twenty-third annual meeting of the American Welding Society will be held from October 12 to 15, inclusive, at the Hotel Cleveland, Cleveland, Ohio. Although the program as outlined accents the importance of welding under the present war-production demands, many of the papers will be of general interest. Fifty-seven papers are scheduled for presentation covering the training of welding operators, fatigue and impact testing of welds, weldability of steels, flame cutting and nondestructive testing and inspection of welds. Other developments in all fields of production welding will be covered.

"Rubber" Box Car for Hauling Oil

A NEW type of box car—lined with synthetic rubber—made its initial appearance in Washington, D. C., during the week ended August 22, and government officials are hopeful that it may be used as a part of the solution of the problem of transporting petroleum to the east coast shortage area. Filled with six cells made of "Mareng," which is fabricated from a synthetic rubber known as "Thiokol," the car was brought to Washington for inspection by Joseph B. Eastman, director of defense transportation, and other high government transportation officials.

A statement from the Glenn L. Martin Company, Baltimore aircraft builders, who developed the Mareng cell, said that the car will be placed in service immediately transporting oils, but that the nature of the tests to which it will be subjected will be determined by the Association of American Railroads, whose representatives will have an opportunity to observe it under actual operating conditions. It is also understood that the Bureau of Explosives will take part in the tests, and the car must meet the approval of the Interstate Commerce Commission.

A 50-ton box car is being used for the first installation of the Mareng cell. It contains six of the cells, which, when filled, resemble huge packing cases. The oil is loaded through a pipe in the top of the car which feeds all the containers. A single discharge valve in the bottom of the car unloads it. The cells are collapsible, and when not in use, can be rolled up. It was suggested that future studies might develop means to get two-way use out of the box cars by stacking the cells in the car when the oil is unloaded and using it for other freight on the return trip.

Each of the cells has 2,500 gallons' capacity. Only two cells of the test unit were filled with oil on the 700-mile trip from Indiana. These filled cells, it was said, were located over the car trucks, and

(*Continued on next left-hand page*)

THE FRANKLIN SYSTEM OF STEAM DISTRIBUTION

*Trade Mark Registered U. S. Patent Office

THE LOCOMOTIVE BOOSTER

INCREASED CAPACITY FOR OVERWORKED LOCOMOTIVES

The unprecedented increase of traffic and the difficulty of obtaining new power have imposed a tremendous burden on our railroads. Therefore, it is imperative that they increase the capacity of existing power.

The means for doing this is at hand.

The Franklin System of Steam Distribution provides at least a third more train load-speed capacity.

The Booster* increases the drawbar pull for starting, accelerating and in any tight place.

With these capacity-increasing factors your locomotives will haul more tonnage at higher speeds.

FRANKLIN RAILWAY SUPPLY COMPANY, INC. NEW YORK CHICAGO

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thus were subject to the maximum roadbed vibration.

The cells, which are the outgrowth of the original self-sealing fuel tank for airplanes, can be used in wooden barges for inland waterways and for other types of railroad cars, according to Reid B. Gray, chief of the Martin laboratories. Mr. Gray also said that he had been assured that there is an ample supply of synthetic rubber from which the cells are constructed and that manufacturing facilities are already available.

Another 80,000 Cars?

TRAFFIC estimates, which are creditably reported as indicating that the next car-building program should contemplate the construction of 80,000 freight cars, have been submitted by the Association of American Railroads to the Office of Defense Transportation. The proposal would in effect be the 1943 program, following upon the building of the 62,000 cars authorized for this year by WPB and the former Supply Priorities and Allocations Board.

It might, however, get under way before the end of the year if there should prevail the view of some railroad officers who believe that employment in the carbuilding industry should be made continuous, thus making it possible to hold labor forces, by the placing of production schedules on a monthly basis.

Freight-Car-Building Programs As of August 1

DURING the month of July, there were delivered an additional 839 cars of the original 36,000 authorized by the former Supply, Priorities and Allocations Board for construction subsequent to February 1 of this year. Of this number, 759 were built by contract car builders and 80 by railroad company shops. The number of cars remaining to be shipped under the SPAB program, as of August 1, was thereby reduced to 1,263, of which 833 were in contract car-builders' shops and 430 in railroad company shops.

Of the 18,000 more cars authorized for 1942 construction by the War Production Board, following its limitation order of April 4, releases were granted by the WPB during July covering an additional 2,323 cars, including 322 covered hopper cars and 1,951 tank cars to be constructed in contract car-builders' shops and 50 covered hopper cars in the Chicago, Burlington & Quincy shops.

Deliveries were made of 1,771 of the cars in the WPB program during July, 900 by contract car-builders and 871 by railroad company shops, and there remained to be delivered on August 1 12,545 of the 15,920 released, 8,381 by contract car-builders and 4,164 by railroad shops. With 1,263 cars remaining in the SPAB quota and 2,080 not yet officially released in the WPB quota, there remains therefore but 15,888 more cars to be delivered to complete the 1942 car-building programs.

Details of the reported status of the freight-car-building programs as of August 1 are shown in the accompanying table.

Camp Named in Atterbury's Honor

THE army training camp at Edinburg, Ind., has been named "Camp Atterbury" in honor of the late Brig. Gen. William Wallace Atterbury, former president of the Pennsylvania, who died on September 20, 1934. General Atterbury won high honors in the fields of military and civil transportation not only in this country, but from five foreign countries as well, as the result of his accomplishments as Director General of Transportation of the American Expeditionary Forces on the staff of General Pershing in the first World War. Camp Atterbury is situated near his birthplace—New Albany, Ind.

Aluminum Company Releases New Training Films

PREPARED especially for use in the training of men engaged in the assembly or repair of aluminum parts and equipment, a series of three non-technical films are being made available to industrial employers by the Aluminum Company of America. Excellently photographed, these films show clearly three separate classes of work performed on aluminum. One film is devoted to welding, the second to riveting and the third to the machining of aluminum and the various alloys of aluminum.

The welding film shows recommended procedures for oxy-acetylene, oxy-hydrogen and electric-arc welding and it also illustrates proper set-ups and operations for production welding using machine and brazing processes. The second film of the series covers the essentials important in obtaining properly riveted joints. Machining, choice of tools, proper speeds and feeds, tool preparation, especially rake and relief angles, and the use of cutting oils are dealt with extensively in the other film of the series. Especially interesting is the information given concerning tool preparation which indicates that tool dressing must be such as to give the finest of cutting edges and the smoothest of finishes to any tool used on aluminum. In general, rake and relief angles are greater than those used on tools for cutting ordinary machining steels.

The films are being distributed through the Aluminum Company's offices in Pittsburgh and they are available in 16 mm. and 35 mm. sizes. The 16 mm. size is also available at the Bureau of Mines, Washington, D. C. The pictures were produced by the Jam Handy Organization, New York.

A.A.R. Directors Concerned Over Motive Power

GROWING concern over the adequacy of freight motive power on the country's railroads in the near future was expressed by railroad executives at the monthly meeting of the board of directors of the Association of American Railroads in Washington, D. C., on July 31. Some of the presidents in attendance pointed out that the present movement of oil to the east coast by the railroads is occupying a large number of freight locomotives and that if this movement continues at its present volume a shortage of locomotives may develop.

Joseph B. Eastman, director of defense transportation, attended the meeting and

(Continued on next left-hand page)

Status of Freight-Car-Building Programs—August 1, 1941

SPAB 36,000 CAR PROGRAM—WPB 18,000 CAR PROGRAM

	Contract Car-Builders	*Railroad Company Shops*	*Total*
Number of cars in original SPAB program not yet delivered:			
Automobile	50	..	50
Box	92	..	92
Flat	..	63	63
Gondola	274	..	274
Hopper	131	367	498
Tank	286	..	286
Total	833	430	1,263
Number of cars in additional 18,000-car program of WPB which were released for construction:			
Flat	1,375	1,125	2,500
Gondola	2,326	2,690	5,016
Hopper	3,872	2,209	6,081
Covered Hopper	322	50	372
Tank	1,951	..	1,951
Total	9,846	6,074	15,920
Number of above WPB released cars not yet delivered:			
Flat	1,372	985	2,357
Gondola	1,976	1,853	3,829
Hopper	3,179	1,276	4,455
Covered Hopper	322	50	372
Tank	1,532	..	1,532
Total	8,381	4,164	12,545
Total backlog of cars on order and undelivered:			
Automobile	1,200	675	1,875
Box	8,326	4,113	12,439
Flat	1,372	1,048	2,420
Stock	..	200	200
Gondola	4,995	1,988	6,983
Covered Hopper	397	75	472
Hopper	13,151	3,678	16,829
Tank	1,828	..	1,828
Refrigerator	..	1,492	1,492
Caboose	25	395	420
Total	31,294	13,664	44,958
Number of total cars on order without WPB authority to build	22,080	8,508*	30,588

* After deducting an additional 562 cars (270 cabooses and 292 refrigerator cars) not chargeable against the SPAB or WPB programs.

Security Brick Arches

are designed

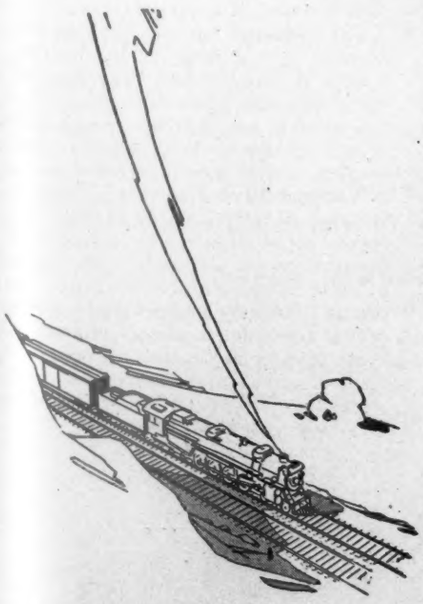
TO SAVE FUEL

To show its full effectiveness as a fuel saver the firebox brick arch must be designed for the class of power in which it is to work.

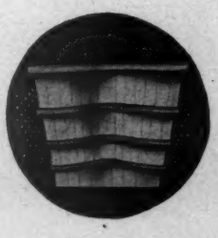
Firebox designs are different and for full effectiveness the brick arch must be designed accordingly.

The Security Sectional Brick Arch is the result of many years of engineering and experience in locomotive operation, in studies of combustion and in the making of refractory brick.

Arch Company engineers over a period of many years have gained and applied a knowledge and experience nowhere else available. This knowledge and experience means many thousands of dollars each year in reduced fuel costs to the railroads of this country.



There's More to
SECURITY ARCHES
Than Just Brick



HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists

AMERICAN ARCH CO.
INCORPORATED
60 EAST 42nd STREET, NEW YORK, N. Y.

Locomotive Combustion Specialists

assured the directors that he would ask the War Production Board to increase the number of locomotives that may now be built under present WPB allocations.

Mr. Eastman, in a statement issued on July 27, said that the Office of Defense Transportation is seeking to avert a motive power shortage by taking steps to increase the efficiency of locomotive operation.

The mechanical section's general plan includes negotiating for the transfer of locomotives from roads that can spare them to roads that need them. Such use of locomotives will be carried out, where necessary, on a lease basis, the borrowing road paying the owner for each day the engine is in service.

Mr. Eastman also disclosed that an inspection tour of various railway shops by representatives of the mechanical section to determine the condition of unserviceable locomotives is now under way. Approximately 7.5 per cent of the total number of steam locomotives are now in the unserviceable class, he noted. The shop survey also covers the availability of materials for repairs.

The number of serviceable freight locomotives now available is about 18,000, Mr. Eastman pointed out. Material allocations to locomotive builders by the War Production Board will make it possible to turn out only about 265 new steam locomotives during the remainder of 1942.

That no motive-power shortage has yet developed, in spite of the sharp increase in power needs resulting from the "unprecedented" volume of freight traffic, is due, Mr. Eastman said, to several factors, one of them being increased efficiency of locomotive servicing. In 1929, Mr. Eastman stated, freight locomotives seldom ran further than 100 to 150 miles before being uncoupled from through trains at district terminal points for servicing and necessary running repairs. At present freight engines frequently run 400 to 500 miles before being cut from trains and sent to the roundhouse.

Surplus Car Material May Be Transferred to Railroads

CAR builders and suppliers can transfer surplus freight car material to railroads, under an interpretation of Supplementary Limitation Order L-97-a-1, issued August 26 by the director general for operations of the War Production Board.

The limitation order permits interchange of surplus material between producers under certain conditions, provided such sales have WPB approval. The interpretation, No. 1, makes it clear that railroads which produce or repair railroad equipment are deemed to be engaged in the same business as car producers, and thus are entitled to purchase surplus freight car material from car builders and suppliers.

Equipment Purchasing and Modernization Programs

Chicago & North Western.—Division 4 of the Interstate Commerce Commission has approved a plan whereby this company will be permitted to substitute gondola, hopper, flat or box cars for equipment specifically called for in the equipment trust dated March 5, 1942. The company also asked authority to permit the trustee of the equipment trust to invest some $3,750,000 of the proceeds of the sale of the certificates in government bonds until such time as the equipment called for in the trust is available.

Grand Trunk Western.—Company forces are engaged in rebuilding and extending nine stalls of the roundhouse at Port Huron, Mich., at a cost of approximately $40,000.

Illinois Central.—The Illinois Central has awarded a contract to the Zitterell Mills Company, Webster City, Ia., for repairs and improvements to its shops at Cherokee, Ia., at an approximate cost of $50,000.

New York, New Haven & Hartford.—The New Haven has applied to the Interstate Commerce Commission for authority to assume liability for $1,390,000 of equipment trust certificates to finance in part the purchase at an estimated cost of $1,737,500 of 10 new 2,000 hp. Diesel-electric "A" unit passenger and freight locomotives, which will ordinarily be operated in pairs.

Northern Pacific.—The Northern Pacific has been authorized by Division 4 of the Interstate Commerce Commission to assume liability for the $2,500,000 of two per cent serial equipment trust certificates reported in the August issue as being requested to finance in part the purchase of 12 freight locomotives of the 4-6-6-4 type at a cost of $3,247,183.

Pennsylvania.—The Pennsylvania has been authorized by Division 4 of the Interstate Commerce Commission to substitute certain equipment for other equipment authorized in Finance Docket No. 13567, construction of which was stopped because of War Production Board orders. Details of the equipment originally authorized and that to be substituted were given in the August issue of the *Railway Mechanical Engineer*, page 362.

Seaboard Air Line.—Division 4 of the Interstate Commerce Commission has approved a plan whereby this company will issue $2,280,000 of 2¾ per cent equipment trust certificates which will be either sold to the Reconstruction Finance Corporation or guaranteed by it. The proceeds of the issue, which will mature in 20 semi-annual installments beginning January 1, 1943, will be used to purchase new equipment costing a total of $3,069,760 and consisting of six 5,400-hp. Diesel-electric freight locomotives and two 1,000-hp. Diesel-electric switching locomotives.

Wabash.—The Wabash has invited bids on August 15 on $2,000,000 of series A 10-year equipment trust certificates, payable in 10 equal maturities of $200,000 each beginning August 1, 1943. Although the equipment is reported to have been released by the War Production Board, the indenture will provide that government bonds may be substituted. The equipment, which will cost $2,585,847, includes 520 steel box cars, 125 tight-end automobile cars, 25 end-door automobile cars, 150 gondola cars and 25 covered hopper cars.

Rubber Classifications and Tests Standardized

A JOINT committee of the American Society for Testing Materials and the Society of Automotive Engineers for several months has been engaged in preparing standard classifications, specifications and tests for natural and synthetic rubbers.

The committee has reduced from several hundred to less than 100 the number of compound classifications, and has established physical properties, characteristics, and standard tests for each compound. The system of classifications, which covers 57 synthetic and 40 natural rubber compounds, is designed both to conserve rubber by enabling industries to select those compounds whose properties are known to meet the requirements of specific uses, and also to make effective use of alternative compounds. Since the classifications cover both natural and synthetic compounds, they will be suitable for use in both the present and post-war periods, and regardless of whether production of synthetic rubber is achieved on a large scale.

Supply Trade Notes

DAN C. HUNGERFORD has resigned as vice-president and director of the Elastic Stop Nut Corporation, Union, N. J.

◆

W. R. DEWEY, plant manager, and *R. E. Spokes*, technical director, have been elected vice-presidents of the American Brakeblok division of the American Brake Shoe & Foundry Co.

D. W. LAMOREAUX, president of the Peerless Equipment Company, Chicago, has been elected a director of Poor & Co., Chicago.

◆

THE STANDARD CAR TRUCK COMPANY, Chicago, has acquired exclusive manufacturing and sales rights for the Bettendorf swing motion caboose truck and parts. It will now be known as the Barber-Bettendorf caboose truck.

◆

AMERICAN LOCOMOTIVE COMPANY.—Five additional assistant superintendents have been appointed for the American Locomotive Company plant at Schenectady, N. Y. The new appointees are *J. W. Biggerstaff; E. W. Bradford; J. P. Fleming; J. A. Graulty* and *J. D. Reynolds.*

(*Turn to next left-hand page*)

A contributing factor to locomotive efficiency is unobstructed steam passages and it is particularly so with respect to superheater design.

This is important when considering new power and equally, if not more important when the maintenance of existing superheater equipment is considered.

Keep this efficiency high by keeping the superheater unit passages unobstructed and well maintained. This can be done by the Elesco Superheater Unit Remanufacturing Service.

KEEP 'EM ROLLING

A-1523

ELESCO

SUPERHEATERS • FEEDWATER HEATERS
AMERICAN THROTTLES • STEAM DRYERS
EXHAUST STEAM INJECTORS • PYROMETERS

THE SUPERHEATER COMPANY

Representative of
AMERICAN THROTTLE COMPANY, INC.
60 East 42nd Street, NEW YORK
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• • •
Montreal, Canada
THE SUPERHEATER COMPANY, LTD.

EDWARD B. GREENE, president of the Cleveland Cliffs Iron Company and formerly a director of Otis Steel Company, Cleveland, Ohio, was elected a director of the Jones & Laughlin Steel Corporation when that company took over the Otis Steel Company.

◆

FRED C. DAVERN has been appointed assistant manager of the railroad sales department of the Standard Oil Company of New Jersey. Mr. Davern has been railroad sales engineer with Esso since March 1, 1933, covering all eastern railroads. His career in the railroad field began in 1908 in the mechanical shops and drafting room of the Erie at Meadville, Pa.

◆

R. L. ROBINSON has been appointed district sales manager of the Brake Shoe and Castings division and the Southern Wheel division of the American Brake Shoe & Foundry Co., with headquarters in St. Louis, Mo. Mr. Robinson was formerly purchasing agent of the Pittsburgh & West Virginia. He joined the American Brake Shoe as a salesman at Pittsburgh, Pa., in 1928, and was transferred to the Chicago sales staff in 1934.

◆

AMERICAN ROLLING MILL COMPANY.—*L. W. Brashares* has been appointed manager of the Cincinnati district of the American Rolling Mill Company, Middletown, Ohio, and *E. D. Dronberger* has been appointed manager at Dayton, Ohio. *C. G. Farabee* has been appointed manager of the Chattanooga, Tenn., district and *G. C. Wilson,* manager of the Middletown district, has been given a leave of absence because of ill health.

◆

WESTINGHOUSE AIR BRAKE COMPANY.—*C. J. Werlich,* representative of the Westinghouse Air Brake Company at St. Paul, Minn., since 1929, has been appointed southwestern manager, with headquarters at St. Louis, Mo., to fill the position left vacant by the recent death of D. W. Lloyd. Prior to joining the Air Brake Company as a mechanical expert in 1920, Mr. Werlich had served as fireman, locomotive engineer and traveling engineer with the Chicago, St. Paul, Minneapolis & Omaha. *T. W. Baldwin* succeeds Mr. Werlich as representative at St. Paul. Mr. Baldwin joined the Air Brake Company as mechanical expert in 1930, after many years of service as a locomotive engineer on the Chicago, Milwaukee, St. Paul & Pacific, and mechanical expert for the Locomotive Stoker Company. *J. G. Gannon,* mechanical expert at St. Louis since 1940, has been appointed district engineer.

◆

GEORGE R. BERGER, 845 South Wabash avenue, Chicago, has been appointed railroad representative in the United States for the sale of Equatemp insulating felts for refrigerator and passenger cars for the Charles Lachman Co., Inc., of Phoenixville, Pa. Mr. Berger began his business career with the Westinghouse Electric & Manufacturing Co. at Newark, N. J., in 1898. Two years later he entered railway service on the Lake Shore & Michigan Southern at Cleveland, Ohio, becoming chief electrician of that road in 1901. He was associated with the New York Central during the following year in a similar capacity at Mott Haven, N. Y. In 1902, he joined the Gould Coupler Company and the Gould Storage Battery Company at Depew, N. Y., in an engineering capacity and was appointed their joint Western representative, with headquarters in Chicago, in 1904. In 1925 he became manager of western sales and, following the reorganization and segregation of the car-coupler and car-lighting business in 1926, he continued as manager of western sales with the newly incorporated Gould Car Lighting Corporation. On June 1, 1927, he resigned to enter the railway supply business on his own account as a manufacturer's representative. Mr. Berger was elected president of the Railway Electrical Supply Manufacturers Association in 1927.

George R. Berger

Army-Navy Production Awards

RECOGNITION of high achievement in the production of war equipment has been made by the presentation of the Army-Navy "E" to the following companies:

American Locomotive Company, Schenectady, N. Y. August 26. Award presented to Duncan W. Fraser, president of the American Locomotive Company, by Maj. Gen. Charles T. Harris, commanding officer of the Aberdeen Proving Ground, Aberdeen, Md. Token presentation of pins by Capt. J. S. Evans, naval ordnance inspector at Schenectady. The Schenectady plant of the American Locomotive Company first received the Navy E award on October 24, 1942. It was renewed on May 23, 1942.

The Bullard Company, Bridgeport, Conn. August 24. Award presented by Col. F. H. Payne, assistant chief of the Springfield Ordnance District, and accepted by E. P. Bullard, president of the company. "E" pins presented to Vincent E. Hughes, chairman of the Bullard War Service Club, an employees organization, by Lt. Commander R. T. Fish of the Hartford Naval Office.

Greenfield Tap and Die Corporation, Greenfield, Mass. August 19.

H. K. Porter Company, Pittsburgh, Pa.

A. VAN HASSEL, president of the Magor Car Corporation of New York, has been elected vice-president and director of the National Steel Car Corporation, Ltd., of Canada.

◆

ROBINSON D. BULLARD, reclamation engineer for the Bullard Company, Bridgeport, Conn., has been appointed technical consultant to the industrial salvage section of the bureau of industrial conservation of the War Production Board. Mr. Bullard will assist in preparing a definitive book on industrial reclamation.

◆

BEATTY MACHINE AND MANUFACTURING COMPANY.—At a recent meeting of the board of directors of the Beatty Machine and Manufacturing Company, Hammond, Ind., the following officers were elected: *W. R. Beatty,* chairman of the board; *L. C. Beatty,* president; *P. H. Beatty,* vice-president; *Charles Aaron,* secretary; *W. Perz,* treasurer, and *Miss C. Kasten,* assistant secretary and treasurer.

◆

HUGO E. BECKER, a sales engineer of the Westinghouse Electric & Manufacturing Company on the Pacific Coast since 1925, has been appointed supervisor of the newly created maintenance sales department for the Pacific Coast district. In this new position Mr. Becker will coordinate the work of three major maintenance divisions of the company—renewal parts, field engineering, and repair plants. He will also coordinate maintenance of existing Westinghouse equipment in the marine industry, of electric utilities, and on transportation systems.

◆

GISHOLT MACHINE COMPANY.—The Gisholt Machine Company, Madison, Wis., has announced several new appointments to their field sales and service personnel in the United States and Canada. Direct sales representatives and agents have been appointed as follows: *Ray Hering,* to the Cleveland, Ohio, office; *Earl K. Baxter,* to the Detroit, Mich., office; *B. C. Greene,* and Steel & Machine Tool Sales, Inc., to the Houston, Tex., territory; the Dawson Machinery Company to the Seattle, Wash., territory; and the Foulis Engineering Sales Company to the Nova Scotia and New Brunswick, Canada and Newfoundland territories, with offices at Halifax, N. S. Direct service representatives have been appointed as follows: *John T. Murray,* to the Dayton, Ohio, office; *Grover Pruett* and *Philip E. Denu,* to the Newark, N. J., office, and *Alfred Math Kuehn,* to the Lockport, N. Y., Pittsburgh, Pa., and Toronto, Canada, territories, with headquarters in Lockport. Agents' sales representatives have been appointed as follows: *D. O. Vincent,* in the Atlanta, Ga., territory; *D. M. Ward,* to cover southern Georgia and Florida, with headquarters at Jacksonville, Fla.; Gordon N. Russell, Ltd., to the British Columbia, Canada territory, with headquarters in Vancouver, Canada, and *C. B. Spaulding,* to the Windsor, Ontario, Canada territory, with headquarters at Windsor.

VICTOR W. ELLETT, president of the Hunt-Spiller Manufacturing Corporation, Boston, Mass., who has become also vice-chairman of the board of directors, as noted in the August *Railway Mechanical Engineer*, started his career as a machinist apprentice with the Atchison, Topeka & Santa Fe at Madison, Iowa, in 1897. From 1901 to 1903 he served as a machinist with the St. Louis, Iron Mountain and Southern

Victor W. Ellet

(now the Missouri Pacific), the Fort Worth & Denver City, and the Choctaw, Oklahoma & Gulf (now the Chicago, Rock Island & Pacific). In 1903-04 he was a machinist for the Santa Fe; 1904-05, an expert tool maker at the United States Government's Rock Island arsenal; 1905-06, a mechanical officer of the Missouri Pacific, and 1906-11, a mechanical officer of the Rock Island. He joined the Hunt-Spiller Manufacturing Corporation as a mechanical representative in 1911 and was appointed sales manager of that company in 1925, vice-president in 1928, and president and general manager in 1936.

Obituary

PERRIN G. MARCH, president of the Cincinnati Shaper Company, died in July at his home in Fernbank, Ohio.

◆

EARL HAMMOND FISHER, assistant to the president of the Wine Railway Appliance Company and assistant to the vice-president of the Unitcast Corporation, Toledo, Ohio, died August 9. Mr. Fisher was 47 years of age.

◆

JOHN P. SYKES, who, prior to his retirement in 1938, had advanced from apprentice to senior vice-president of the Baldwin Locomotive Works during 59 years of service with that company, died August 16. He was 82 years of age. Mr. Sykes joined the Baldwin Locomotive Works as an apprentice in 1879. His advancement was steady and he served in the capacities of contractor, assistant foreman and general foreman until 1905, when he was appointed general superintendent of the (then new) Eddystone, Pa., shops. In 1907 he left the parent company to become general superintendent of its subsidiary, the Standard Steel Works Company, at Burnham, Pa., returning to Baldwin in 1910 as assistant general superintendent. In July, 1911, he was appointed general superintendent, and in September, 1917, became vice-president

John P. Sykes

in charge of manufacture. In May, 1922, he was appointed senior vice-president in charge of plants and manufacture, and in 1931 was elected a director. Mr. Sykes resigned his positions and retired from active participation in the affairs of the Baldwin Locomotive Works in March, 1938.

◆

JOHN G. BENEDICT, president of the Landis Machine Company, died in the Waynesboro Hospital, Waynesboro, Pa., on August 4, after an illness of two years. Mr. Benedict was born near Ringgold, Md., April 21, 1872. He attended the public schools of Waynesboro and was graduated in 1898 from the State Teachers College, Shippensburg, Pa. He taught school for several years during his college career and for two years following graduation. He started his industrial career in 1900 as an employee in the office of the Landis Tool Company. A little later he became identified with the Fred Frick Clock Com-

John G. Benedict

pany, Waynesboro, as secretary. Then he was appointed branch manager for Minneapolis for the Geiser Manufacturing Company, also of Waynesboro. Early in 1904 he was called to Waynesboro to become secretary and treasurer of the Landis Machine Company. Mr. Benedict was also President of the Canadian Landis Machine Company, Welland, Ont.

◆

T. AURELIUS, who retired in 1940 as vice-president and manager of sales of the Railroad division of the Colorado Fuel & Iron Co., Denver, Colo., died on July 31.

◆

THOMAS F. KILCOYNE, traveling engineer for the American Arch Company, Inc., died August 10, at Cincinnati, Ohio. Mr. Kilcoyne had been associated with the American Arch Company for 30 years. He was formerly a boilermaker on the Pennsylvania at Altoona, Pa., and a boiler inspector for the Chesapeake & Ohio at Huntington, W. Va.

Personal Mention

General

R. L. REX has been appointed mechanical assistant of the New York, Ontario & Western.

GERALD P. TRACHTA, assistant chief operating officer-mechanical of the Chicago, Rock Island & Pacific, has been appointed general superintendent of motive power, with headquarters as before at Chicago. This is a change of title.

E. H. TALBERT, traveling fireman, Hinton division, of the Chesapeake & Ohio, has become motive-power inspector.

L. W. WITHROW, mechanical assistant, operators, of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette, has retired.

M. C. PRENTISS has been appointed engineer of motive power of the New York, Ontario & Western, with headquarters at Middletown, N. Y.

S. M. HOUSTON, assistant superintendent of motive power of the Southern Pacific at Los Angeles, Calif., has been appointed assistant general superintendent of motive power, with headquarters at San Francisco, Calif. Mr. Houston started railroad work as a machinist apprentice with the Arizona Eastern (now controlled by the Southern Pacific) in 1913, advancing through various positions to master mechanic in 1923. In 1924 he was trans-

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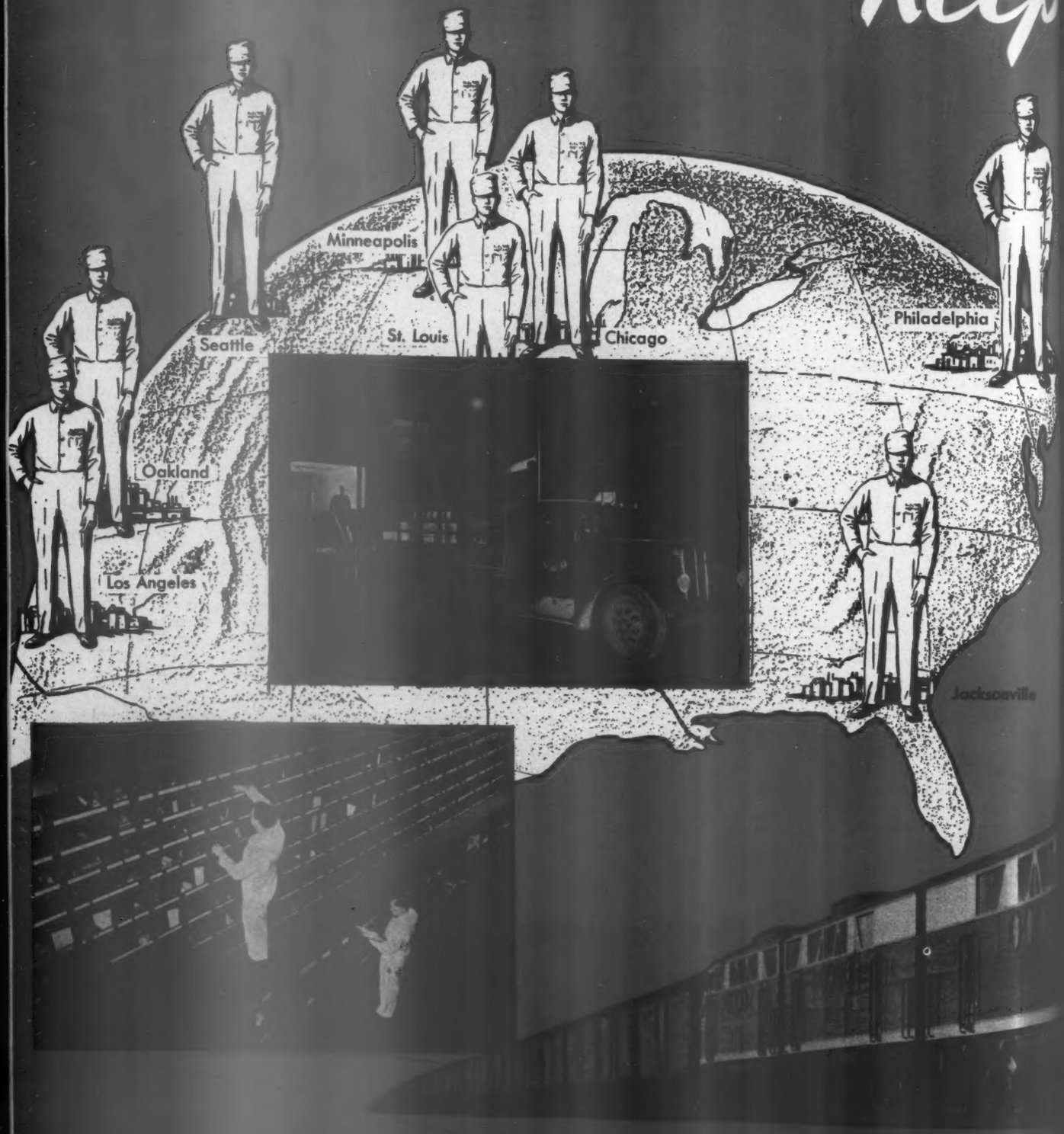
GM SERVICE"

Keep G



ELECTRO-MO V

GENERAL MOTORS CORPORATION

E "WARDENS"

ep GM Diesels Rolling

TRANSPORTATION is the most far reaching of all the indispensable war activities. To meet the present emergency, all available locomotives have been pressed into service and are being used to the limit of their capabilities . . . General Motors Diesel Road Locomotives are playing a vital part in the nation's transportation network and everything possible is being done to keep these super-performers rolling with the highest degree of availability.

GM Service "Wardens" and eight strategically located parts depots STAND GUARD day and night to protect this equipment. Every order for parts must leave the closest depot within the working day and normally no replacement part is more than 24 hours away from any piece of GM equipment in service. This long established service policy insures your receiving the right part—at the right place—at the right time—properly applied and at a fair price. GM Diesel Freight Locomotives are making possible:—reduction in train miles as much as 50 per cent—faster schedules—increased tonnage hauling capacity—and for each Diesel operated release as many as five heavy steam locomotives for other important services.

TRANSPORTATION IS VITAL TO VICTORY

O VE DIVISION

LA GRANGE, ILLINOIS, U.S.A.

ferred to the Southern Pacific of Mexico as shop superintendent at Empalme, Son., later becoming successively superintendent of motive power and assistant general manager. In 1937 he was appointed assistant master mechanic of the Western division of the Southern Pacific at West

S. M. Houston

Oakland, Calif., and a year later became master mechanic. Mr. Houston was appointed assistant superintendent of motive power at Los Angeles in March, 1939.

GEORGE MCCORMICK, general superintendent motive power of the Southern Pacific at San Francisco, Calif., retired on July 31. Mr. McCormick was born at Columbus, Tex., on July 15, 1872, and was a graduate in mechanical engineering from the Agricultural and Mechanical College (now Texas A. & M.) at Bryan, Tex., in 1891. He entered railway service on October 5, 1891, as a machinist apprentice in the employ of the Galveston, Harrisburg & San Antonio (now part of the Southern Pacific Lines in Texas and Louisiana) at Houston, later being promoted to draftsman in 1893 and transferred to San Antonio in 1894. He returned to Houston in 1895 as chief draftsman. In 1900 he was promoted to the position of mechanical engineer and in December, 1911, became assistant superintendent of the El Paso division, with headquarters at El Paso, Tex. In February, 1913, Mr. McCormick was appointed assistant general manager (mechanical) of the Southern Pacific, Texas lines, with headquarters at Houston, and in December, 1916, became general superintendent of motive power of the Pacific lines, with headquarters at San Francisco. Mr. McCormick invented many safety devices for locomotives, including an improvement in the design and application of locomotive boiler drop plugs to prevent boiler explosions, retaining clips to prevent loose tires from slipping off wheel centers and a truck pedestal safety tie bar. He also invented a system of oil lubrication for locomotive driving boxes and other bearings. He has been responsible for the development of outstanding types of motive power on the Southern Pacific, including the streamline Daylight type of locomotive and the cab-ahead articulated-consolidation locomotives. In recognition of his many contributions to railroad engineering, he was named a "modern pioneer" by the National Association of Manufacturers in 1940, and in 1941 was awarded the honorary degree of Doctor of Engineering by his alma mater, Texas A. & M. He has served on numerous important committees of the Mechanical division of the Association of American Railroads, and was elected a member of the General committee of the Mechanical division in 1939. More complete biographical

George McCormick

data concerning the training and accomplishments which led to his honorary degree of Doctor of Engineering at Texas A. & M. appear in the January, 1942, issue of the *Railway Mechanical Engineer*, page 15.

BEN M. BROWN, assistant general superintendent of motive power of the Southern Pacific, has been appointed general superintendent of motive power, with headquarters as before at San Francisco, Cal., succeeding George McCormick, who retired on July 31. Mr. Brown was born at

Ben M. Brown

Rockport, Tex., on June 15, 1890, and is a graduate in mechanical engineering from Texas A. & M. (1911). He entered railway service on June 15, 1911, as a special apprentice in the employ of the Galveston, Harrisburg & San Antonio, later serving as a draftsman at Houston, Tex., and apprentice instructor at the San Antonio (Tex.) shops. In 1914 he became enginehouse foreman at Beaumont, Tex., later serving as drop-pit foreman at Houston and enginehouse foreman at El Paso. Mr. Brown was appointed general shop foreman at Houston in 1916, and master mechanic at El Paso in 1919. In 1923 he became assistant superintendent of motive power and equipment of the Southern Pacific Lines in Louisiana, with headquarters at Algiers, La. Two years later he returned to the Texas lines as chief assistant superintendent of motive power, with headquarters at Houston. On November 15, 1936, he was transferred to the Southern Pacific, Pacific lines, as assistant general superintendent of motive power, with headquarters at San Francisco.

L. H. OAKS, assistant road foreman of engines on the Ft. Wayne division of the Pennsylvania, has been promoted to general air brake inspector of the Western region, with headquarters at Chicago.

A. H. GLASS, motive power inspector of the Chesapeake & Ohio, has been appointed mechanical assistant, operators, of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette.

F. E. RUSSELL, JR., master mechanic of the Southern Pacific at El Paso, Tex., has been appointed assistant superintendent of motive power, with headquarters at Los Angeles, Calif.

Master Mechanics and Road Foremen

D. A. GUIDRY, locomotive engineer of the Illinois Central, Baton Rouge, La., has become fuel engineer at Chicago.

W. M. TOLLEFSON, locomotive engineer of the Illinois Central at Waterloo, Iowa, has become fuel engineer at Memphis, Tenn.

H. O. WELCH, fireman instructor of the Atlantic Coast Line at Waycross, Ga., has been appointed road foreman of engines with headquarters at Waycross.

T. B. DOBBINS, general foreman of the Atlantic Coast Line at Thomasville, Ga., has been appointed master mechanic at Waycross, Ga.

F. WEBB, fuel engineer of the Illinois Central at Chicago, has been promoted to traveling engineer on the Iowa division, west of Waterloo, Iowa.

HARWOOD S. FLIPPEN has been appointed road foreman of engines of the Atlantic Coast Line, with headquarters at Wilmington, N. C.

D. R. CALLERI, assistant master mechanic of the Southern Pacific at Roseville, Calif., has been appointed master mechanic, with headquarters at El Paso, Tex.

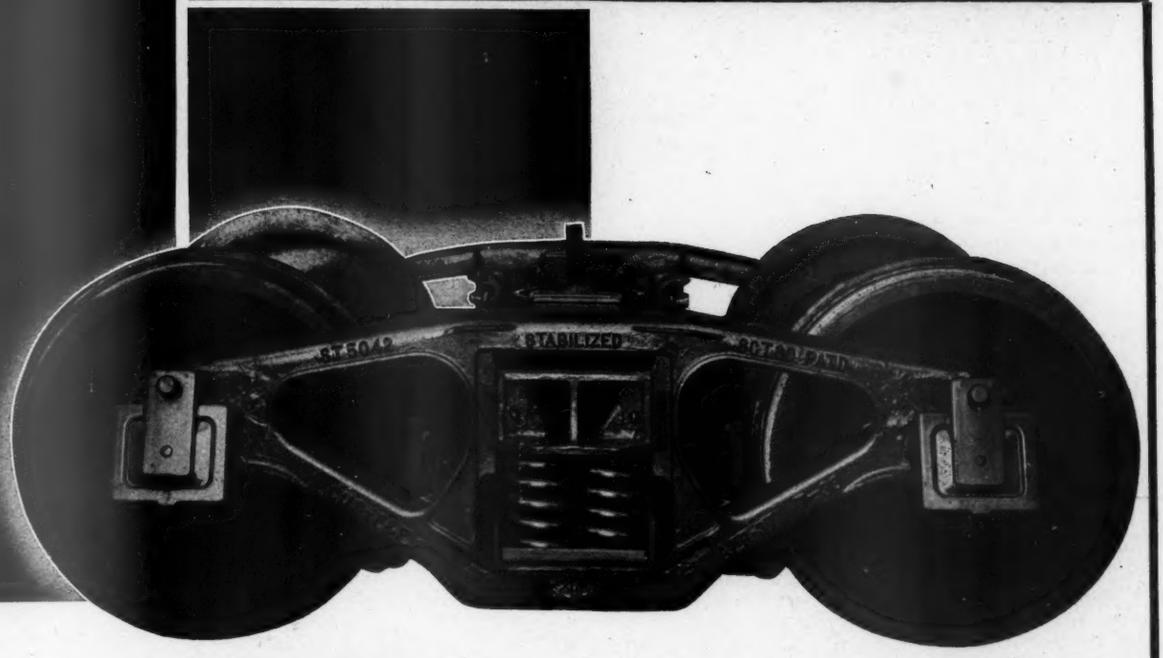
T. C. NELMS, fuel engineer of the Illinois Central at Memphis, Tenn., has been promoted to traveling engineer on a portion of the Kentucky division.

A. H. WILLIAMS, general foreman of the Atlantic Coast Line, with headquarters at Wilmington, N. C., has been appointed master mechanic of the Wilmington district, with the same headquarters.

(*Turn to next left-hand page*)

STABILIZE *Against*

CAR & LADI



ELIMINATE *Destructive Spring* "BOUNCING"

Cars equipped with BARBER STABILIZED Trucks enjoy a smooth easy ride under all conditions of load and speed.

At small cost these Stabilized Parts are built into the bolsters . . . . where they eliminate all looseness and produce sufficient friction to minimize excessive harmonic spring bouncing.

Barber Stabilizing is *inexpensive and permanent*, any slight wear that may develop being automatically absorbed.

Over 58,000 Car Sets of Stabilized Trucks are giving satisfactory service on 44 Roads and Private Car Lines.

Specify Barber Stabilized Parts for New and Rebuilt Cars!

STANDARD CAR TRUCK COMPANY

332 SOUTH MICHIGAN AVE. **CHICAGO, ILLINOIS**

R. H. DUNCAN, general foreman of the Atlantic Coast Line, with headquarters at Montgomery, Ala., has been appointed master mechanic of the Montgomery district, with the same headquarters.

J. C. MILLER, superintendent of shops of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed master mechanic of the Nickel Plate district, with headquarters at Conneaut.

Car Department

G. J. FLANAGAN, has been appointed general car inspector of the New York Central system, with headquarters at New York.

C. N. KITTLE has been appointed division general car foreman of the New York Central, with headquarters at Buffalo, N. Y.

T. W. GABLER has been appointed division car foreman, Mahoning division, of the Erie, with headquarters at Brier Hill, Ohio.

Shop and Enginehouse

E. Y. NITRAUER, shop superintendent of the Erie at Susquehanna, Pa., has been transferred to the position of shop superintendent at Port Jervis, N. Y.

P. M. MITCHELL, shop superintendent of the Erie at Port Jervis, N. Y., has been appointed chief shop inspector, with headquarters at Cleveland, Ohio.

F. C. WENK, road foreman of engines of the Atlantic Coast Line at Waycross, Ga., has been appointed general foreman at Thomasville, Ga.

L. S. KURFESS, chief shop inspector of the Erie at Cleveland, Ohio, has been furloughed to accept a commission in the United States Army.

H. G. DUGAN has been appointed general and erecting-shop foreman of the shops of the New York, Chicago & St. Louis, with headquarters at Conneaut, Ohio.

A. H. ADANG, general and erecting-shop foreman of the shops of the New York, Chicago & St. Louis at Conneaut, Ohio, has been appointed superintendent of the shops at Conneaut.

L. E. SCHUETTE, division car foreman of the Mahoning division of the Erie, at Brier Hill, Ohio, has been appointed shop superintendent at Susquehanna, Pa.

C. A. WHITE, general foreman of the Atlantic Coast Line at Waycross, Ga., has been furloughed for military duty as a major in the 703rd Engineers, Railway Grand Division, U. S. Army.

Purchasing and Stores

T. P. HARRIS, purchasing agent of the Grand Trunk Western at Detroit, Mich., has been appointed purchasing agent of the Canadian National, with headquarters at Winnipeg, Man. Mr. Harris was born at Bristol, England, on October 26, 1896, and entered railway service in June, 1911, with the Grand Trunk Western. He left that road in February, 1915, to enlist in the Canadian Expeditionary Force, and on demobilization in May, 1919, Mr. Harris returned to the purchasing department. He was appointed purchasing agent at Detroit in July, 1938.

GEORGE L. MITCHELL, assistant to the executive vice-president and assistant secretary of the Atlantic Coast Line, has been appointed to the newly created position of assistant purchasing agent, with headquarters as before at Wilmington, N. C.

H. M. DEWART, purchasing agent of the Central Vermont, at St. Albans, Vt., has been appointed purchasing agent of the Grand Trunk Western with headquarters at Detroit, Mich. Mr. Dewart was born at St. Albans, Vt., on April 17, 1893, and entered railway service as a clerk in the accounting department of the Central Vermont at St. Albans. In May, 1912, he was transferred to the purchasing department and appointed chief clerk on November 1, 1913. In 1917 he became assistant purchasing agent and in June, 1918, purchasing agent at St. Albans.

Obituary

THOMAS B. WHITEHEAD, for 21 years general foreman of the boiler department of the Seaboard Air Line shops at Jacksonville, Fla., died on August 12, after a long illness.

JAMES A. CARNEY, at one time superintendent of shops of the Chicago, Burlington & Quincy at West Burlington and later successively, superintendent of shops at Aurora, Ill., supervisor of fuel economy at Chicago, and superintendent of safety, died of a heart attack at his home in Aurora on July 17. Mr. Carney had retired in 1937.

CHARLES JAMES, who retired as superintendent of motive power of the Erie on February 28, 1938, died at his home in Shaker Heights, Ohio, on July 24 in his 76th year. Mr. James entered the service of the Erie as a machinist at Huntington, Ind., on December 19, 1890, and was appointed superintendent of motive power on November 1, 1927, with headquarters at New York, being transferred to Cleveland, Ohio, in 1931. Prior to going with the Erie Mr. James served for ten years with the Lake Shore & Michigan Southern (New York Central).

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

WELDING ELECTRODE CONSERVATION.—Air Reduction Sales Co., 60 East Forty-second street, New York. Fourteen-page "fight waste" bulletin consisting of a series of shop posters illustrating common wasteful arc-welding practices and corresponding good practices.

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MACHINING ALUMINUM. — Aluminum Company of America, Pittsburgh, Pa. New edition of "Machining Alcoa Aluminum," in two parts—General Machining Practice and Automatic Screw Machine Practice. Sets forth general principles of machining aluminum and its alloys; suggests speeds, feeds and depths of cut; points out where practices and tools common to other metals may be used, and indicates where special practices or tools are desirable.

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A three-unit auto-railer train designed to carry explosives from point to point within a large Midwestern ordnance plant

The train, built by the Evans Products Company, consists of a locomotive unit and two trailers. The locomotive is powered by a six-cylinder, 125-hp. Waukesha gasoline engine and is driven through a conventional automotive transmission with rear-end drive to two double-wheeled driving axles. Pneumatic-tired wheels, 36 in. in diameter, carry the load at all times, both on and off the rails, but retractable flanged steel wheels (four per unit) serve to hold the cars on the rails when moving on the track. All three units are equipped with standard Westinghouse AB air brakes controlled from the cab, but operating on brake drums on the inner of each pair of rubber-tired wheels. Separate sets of brake equipment are provided for track and highway operation. The wheels on all three units follow in the path of the wheels on the locomotive, their movement being controlled through tow bars.